DOCUMENT RESUME

ED 037 058 EM 007 668

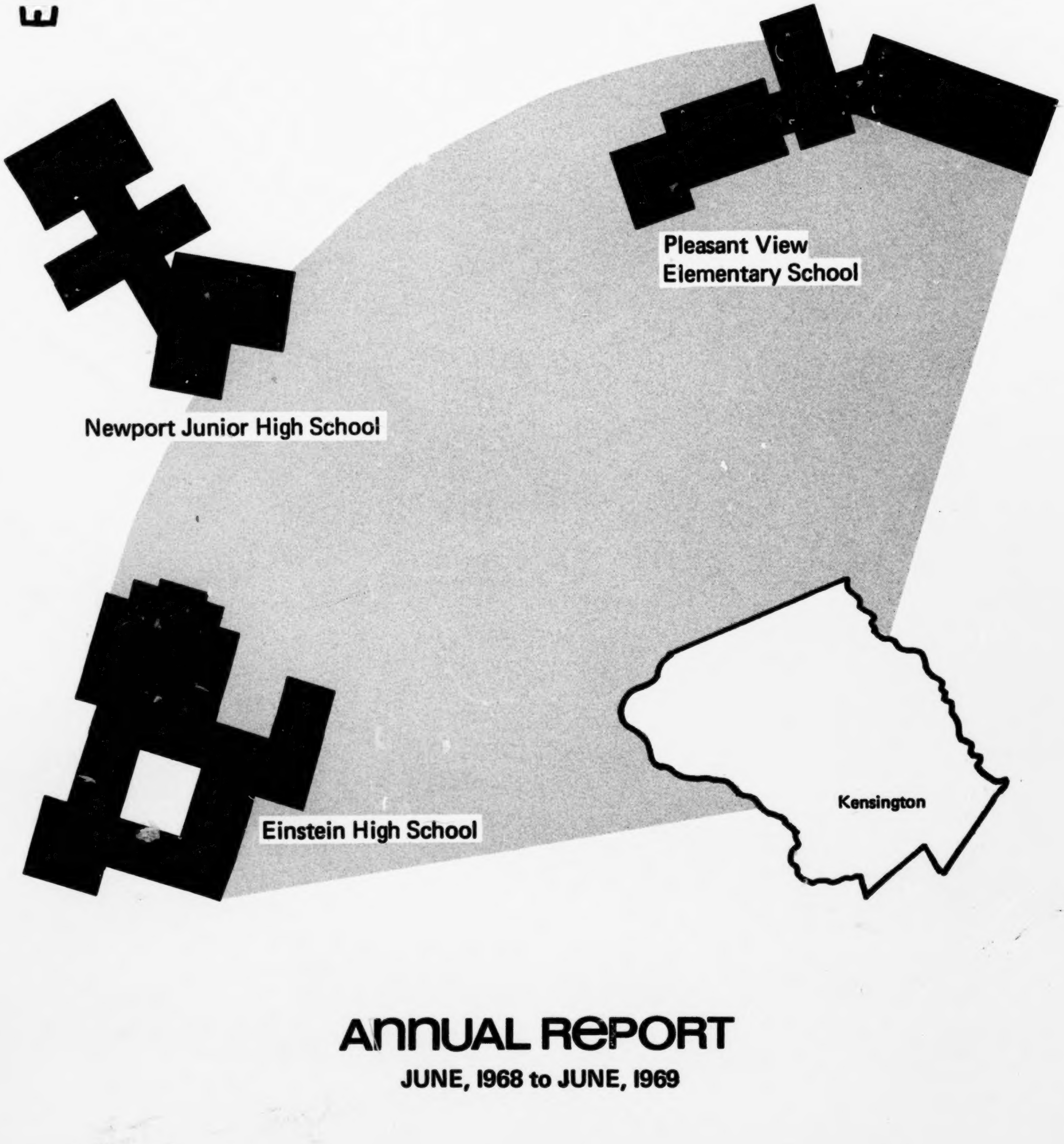
AUTHOR	Wastler, B. Jean, Ed.
TITLE	Project REFLECT: Computer-Assisted Instruction Project. Annual Report June 1968 to June 1969.
INSTITUTION	Montgomery County Public Schools, Rockville, Md.
SPONS AGENCY	Office of Education (DHEW), Washington, D.C. Div. of Library Services and Educational Facilities.
PUB DATE	69
NOTE	124p.
EDRS PRICE	EDRS Price MF-$0.50 HC-$6.30
DESCRIPTORS	*Computer Assisted Instruction, *Computer Oriented Programs, *Curriculum Development, *Educational Research, Individualized Instruction, Instructional Design, Instructional Innovation, Instructional Media, *Instructional Technology, Multimedia Instruction, Research Design, Systems Approach
IDENTIFIERS	IBM 1500 Instructional System

ABSTRACT

Although computer applications in the commercial and scientific realms have expanded tremendously, only a small number of the computers in the public schools are utilized for instructional purposes, and an even smaller number are capable of CAI applications. The terminal objective of Project REFLECT is the design of a model plan which could be utilized by other public school systems in the implementation of validated and feasible CAI technologies. Project REFLECT is designed to answer questions such as: Which basic CAI techniques and strategies are effective in the public school environment for which specific subject matter disciplines and for what student target populations? Which CAI applications can be shown to be effective in the public school environment for which specific subject matter disciplines and for what student target populations? Which CAI techniques, strategies, and applications are feasible for the immediate future? What resources (personnel, materials, equipment, money, etc.) and planning are necessary to implement those feasible CAI applications identified in question three? The activities to date deal with planning, equipment, staff development and modular instructional packages. (MM)

ED037058

PROJECT REFLECT


Pleasant View
Elementary School
Newport Junior High School
Einstein High School
Kensington

ANNUAL REPORT

JUNE, 1968 to JUNE, 1969

COMPUTER-ASSISTED INSTRUCTION PROJECT

MONTGOMERY COUNTY PUBLIC SCHOOLS

Rockville, Maryland Homer O. Elseroad, Superintendent

EM007668

ED037058

PROJECT REFLECT

COMPUTER-ASSISTED INSTRUCTION PROJECT

K - 12

Title III, E.S.E.A. of 1965

William M. Richardson, Director

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

ANNUAL REPORT

for

June 1, 1968 to June 26, 1969

B. Jean Wastler, Editor

Project REFLECT
Albert Einstein High School
11345 Newport Mill Road
Kensington, Maryland 20795

Montgomery County Public Schools
Rockville, Maryland
Homer O. Elseroad, Superintendent

FOREWORD

Computer applications in the commercial and scientific components of our society have experienced a tremendous growth in the last 15 years. Although a marked increase has been noticed in the number of public school systems utilizing computers, to date this increase has had far less impact on public education than on other sectors of our society. Of the computers in public schools, only a small number are utilized for instructional purposes; and an even smaller number are capable of CAI applications.

For the past decade, educators have heard talk about the great "Educational Revolution of the 1960's and 70's" and how the computer would be the focal point of the revolution. In actuality we may be experiencing the first struggling years of an evolution in education where the true role and value of the computer are yet to be validated. Computer-assisted instruction, coupled with the newly educational technology, holds great potential for improving the instructional process in public schools. Montgomery County Public Schools does not look upon CAI as a total self-contained learning system but rather as one possible instructional component of a more complex, individualized, multi-media learning system. Computer-assisted instruction has as its foundation the fundamental concepts of educational technology and, more explicitly, individualized instruction. One objective of this project is to identify and test the various instructional techniques of CAI and the administrative role of the computer in the instructional process.

Successful application of the systems approach, modern management, and instructional technology to public schools will necessitate what might be considered as major educational changes. Through the activities of this project and others like it, valuable insight should be obtained concerning the changing role of public schools in the design, implementation, and validation of instructional innovations. I would like to take this opportunity to express my appreciation to the Board of Education of Montgomery County and its superintendent, Dr. Homer O. Elseroad, for having provided the total support and enthusiasm that have been necessary for this project to be successful to date and that will assure that the project more than adequately accomplishes its objectives. Only this total commitment of the MCPS staff will allow the project to continue with the same success that it has experienced to date.

The purpose of this report is to describe the activities of the first twelve months of a public school CAI project. The educational researcher will find little in the way of "hard data" concerning the explicit benefits of CAI. It is anticipated that this report will be of benefit to those individuals that are interested in CAI; however, it is primarily intended for the reader who is affiliated with an organization which might be considering initiating a CAI program. Although the planning activities of this project are based upon an explicit computer hardware configuration, the same considerations should apply to other hardware systems. It is anticipated that forthcoming reports will indicate detailed results and findings concerning the utilization of CAI in Montgomery County Public Schools.

William M. Richardson,
Director

ED 037058

The work presented or reported herein was performed pursuant to a Grant from the U. S. Office of Education, Department of Health, Education, and Welfare. However, the opinions expressed herein do not necessarily reflect the position or policy of the U. S. Office of Education, and no official endorsement by the U. S. Office should be inferred.

SUMMARY OF REPORT

PROBLEM AND OBJECTIVES

The number of students attending public schools has increased significantly at a time when the technological and social knowledge explosion has exponentially increased the amount of knowledge to be acquired by the learner. In addition, new techniques of student diagnosis, combined with the application of new knowledges about the learner, have revealed a greater spectrum of individual differences among students. Consequently, recent emphasis has been placed upon the need for instruction to be learner-centered, wherein the individual differences in learning styles, needs, and aspirations of the student are accommodated. CAI appears to hold great potential for meeting this critical instructional need.

The task that lies ahead is the design of an effective learning system which provides for the individualization of instruction, promotes student participation and creativity, and assures the teacher sufficient time to motivate and guide the learning process of students. Educators have attempted to identify the role that CAI will play in such a learning system, and projects such as this are now beginning to validate the potential roles of CAI. Project REFLECT is designed to answer questions such as:

1. Which basic CAI techniques and strategies are effective in the public school environment for which specific subject matter disciplines and for what student target populations?
2. Which CAI applications can be shown to be effective in the public school environment for which specific subject matter disciplines and for what student target populations?
3. Which CAI techniques, strategies, and applications are feasible for the immediate future?
4. What resources (personnel, materials, equipment, money, etc.) and planning are necessary to implement those feasible CAI applications identified in question 3?

These same four questions should also be addressed in light of the individualized multi-media learning system which is presently being discussed and which might appear in the future.

Thus, the terminal objective of Project REFLECT is the design of a model plan which could be utilized by other public school systems in the implementation of validated and feasible CAI technologies.

APPROACH

The approach taken to accomplish the project objectives is the validation and evaluation of CAI materials adapted or developed by the project staff. Rather than developing a complete course of instruction in a single subject area, the project is designing modular instructional packages (MIP's) which utilize a variety of CAI techniques and strategies for various student target populations. Through validation of these instructional packages, data will be collected which should provide answers to the questions stated above. Design teams, consisting of one full-time teacher and three to four 10 per cent supporting teachers, are presently involved in the design of CAI modular instructional packages in junior high science, junior/senior high mathematics, high school science, elementary arithmetic and language arts, and high school French.

Project activities have been divided into three one-year phases. The first year of the project was devoted to planning, staff orientation and training, and facilities design. The computer system was installed and operational during the last five months of the first phase. Phase II activities will include the continued adaptation and development of CAI MIP's and student tryout and validation of CAI materials. The third phase will constitute the formal evaluation of CAI materials, documentation, and reporting of findings.

ACTIVITIES TO DATE

Project Planning

A Master Plan and its sub-plans were designed to provide operational guidelines and procedures for the various components of the CAI project. For example, the Curriculum Development Sub-Plan indicates the procedures to be utilized in the design and adaptation of CAI modular instructional packages. Others which have been completed are Documentation Sub-Plan, Validation Sub-Plan, Project Management Sub-Plan, and Staff Development Sub-Plan. Those outlined for completion during Phase II include the Technical Support Sub-Plan and Evaluation Sub-Plan.

Equipment

The computer system being utilized in Project REFLECT is the IBM 1500 Instructional System. The central processing unit and eight remote terminals are presently located in Albert Einstein High School, Kensington, Maryland. Student terminals in the high school consist of cathode ray tube instructional displays with light pens; two of the four CRT's have a random-access image projector. Planned for Phase II installation are four additional terminals to be located in Pleasant View Elementary School on an adjacent property, four more terminals in Albert Einstein High School, and audio enhancements for one Einstein terminal.

Staff Development

Six staff teacher-specialists have been trained in skills necessary for the development of CAI instructional packages. In addition, 22 part-time supporting teachers have completed an 80-hour course in educational technology and CAI materials development. Orientation programs have been organized and developed for teachers and administrators. The technical staff has received formal orientation and on-the-job training on the IBM 1500.

Modular Instructional Packages

As available CAI materials were reviewed and evaluated and the lack of available, suitable materials became evident, project efforts moved from production of a limited number to production of a greater number of modular instructional packages.

Twenty lesson segments, including elementary school arithmetic, senior high school mathematics, junior high school science, and senior high school chemistry and physics, have been brought to various stages of development.

These single concept packages use a variety of the presently known CAI techniques of drill and practice, simulation, remote computing, testing, and tutorial dialogue and attempt to extend these techniques and develop new ones.

PLANS FOR PHASES II AND III

Preparation of modular instructional packages and adaptation of other curriculum materials will be followed by tryout and validation. Staff development activities will continue at an expanding level. Research activities on the learning process will be initiated. Evaluation of CAI materials, documentation, and reporting of findings will culminate in June, 1971, with the production of a model plan for the application of CAI in a large public school system.

Table of Contents

Page

Introduction 1

Planning 11

Facility and Equipment 65

Staff Orientation, Development, and Responsibilities . . . 79

Modular Instructional Packages Production 91

Research 107

Plans for Phases II and III 123

Appendices 131

INTRODUCTION

Contributors

William M. Richardson

B. Jean Wastler

OVERVIEW

Demonstration of the feasibility of staff involvement at all levels in the use of Computer-Assisted Instruction as an instructional medium and assessment of its role in an operational school setting are the goals of this project, funded under Title III of the Elementary and Secondary Education Act of 1965 with support from the Montgomery County (Maryland) Public Schools. This report of accomplishments covers the first phase (June 1, 1968, to June 26, 1969) of the three-year program to develop a system-wide understanding of, familiarity with, and capability for using CAI to improve the educational process. This chapter includes a description of the project, project objectives, progress toward the objectives, and project phases.

THE SETTING

Montgomery County, Maryland, a suburb of Washington, D. C., contains 494 square miles and has a population of approximately 500,000. The public school system, the 20th largest in the nation with a present enrollment of 121,484, has a history of innovation in curriculum design, educational research, staff development, testing and appraisal, instructional materials, and data systems.

The project schools, Albert Einstein High School, Newport Junior High School, and Pleasant View Elementary School, are located on adjoining properties in a heavily-populated section known as the Kensington-Wheaton area. The combined student population of the schools is 3,559.

PROJECT REFLECT

This Research into the Feasibility of Learnings Employing Computer Technology (REFLECT) involves the determination of where, with whom, by what technique, and in what context can Computer-Assisted Instruction improve the learning process in a large public school system. In this project, Computer-Assisted Instruction is viewed as but one instructional component of a comprehensive, individualized, multi-media learning system design.

Initial impetus for this particular project was established by a few individuals within the school system with specific direction provided by the superintendent. The Department of Research, under the direction of Dr. Samuel Goodman, wrote the original Title III proposal. The idea of working in the area of CAI had been discussed within MCPS since early 1966; the funded proposal was not the first CAI proposal developed by the county.

On the recommendation of the superintendent of schools, Dr. Homer O. Elseroad, the Montgomery County Board of Education authorized him to seek grant funds for the project (Board Action: March 12, 1968). The proposal seeking these funds was submitted June 27, 1967. "Project to Develop Effective Use of Computer-Assisted Instruction in a Large Public School System" was approved by the United States Office of Education. The proposal summarized purposes of the project: "to set up the facilities and a program for bridging the gap between technology and the school curriculum, to develop staff understanding, and to explore the effectiveness of the use of computer-assisted instruction within a large public school system."

Funding was negotiated by Mr. William Feddeman, director of the Department for the Planning and Development of Federal and State Programs. The United States Office of Education funded the project for the first phase, commencing June 1, 1968, with $166,363. The Montgomery County government, through its financial commitment to the school system and the leadership of the Board of Education, has supplied funds for the involvement of the supporting teachers, the office equipment necessary for the project staff, the modification of the facility including some construction, wiring and air-conditioning, and a portion of the costs of cable needed to connect the terminals in the project schools to the computer at Albert Einstein High School.

Multi-media stations at Pleasant View Elementary School, Newport Junior High School, and Albert Einstein High School were to be cable-connected to a computer located at

Einstein. The computer and seven student stations, components of the IBM 1500 Instructional System, were installed in Einstein High School in February, 1969. Pleasant View terminals are to be cable-connected to the computer for September, 1969, operation. In May, 1969, when Title III funding was determined to be considerably below that needed to support Phase II as planned, the cable connection to Newport Junior High School was eliminated from the plans.

Instructional stations, or terminals, will vary from location to location; but each will consist of some of the following components: cathode ray tube instructional display with light pen, image projector, typewriter, and audio unit.

Guided by Mr. William M. Richardson, project director, six teacher specialists who have been trained in CAI curriculum adaptation and development serve as team leaders for small groups of classroom teachers working part-time in the development of instructional materials for use in the project. Nine classroom teachers, working 10 per cent of their time with the project, have completed a training course and are serving as members of teams developing materials. Eleven additional "supporting teachers" have completed the approximately 80-hour individualized course in educational technology and CAI and will serve as "design team members" developing modular instructional packages. The primary effort in materials development and evaluation of available instructional materials is in the areas of elementary arithmetic, junior and senior high school mathematics, junior high science, and senior high science (chemistry and physics). Other areas of development and evaluation include foreign languages and social studies. An experienced technical systems manager, a computer operator, and four programmers provide the technical support for these efforts.

The Computer-Assisted Instruction Project, which uses the acronym REFLECT, is a functioning unit of the Montgomery County public school system. Originators of the proposal had the foresight to structure the project so that it was not contained solely within any one department of the school system. In the organizational structure of the Montgomery County Public Schools, the project is located under Dr. Joseph J. Tarallo, assistant superintendent for administration, thus enabling the project director to work directly with all departments of the school system. Many functioning working relationships have been established with departments and individuals.

PROJECT OBJECTIVES AND PROGRESS MADE TOWARD MEETING THEM

Phase I of the three-year feasibility study to evaluate the role the computer can play in assisting the teachers to individualize instruction was the initiation time for many activities that will continue through the life of the project.

Content, purpose, and intent of the original objectives cited in the project proposal to the United States Office of Education remain unchanged; however, the objectives have been restated in a more explicit, measurable manner.

Following the statement of each objective is a brief summary of progress from June 1, 1968, to June 26, 1969. All objectives are stated in terms of accomplishment of the activities at the conclusion of the three-year period.

Objective A: THE DESIGN, DEVELOPMENT, CONDUCTION, VALIDATION, AND DOCUMENTATION OF AT LEAST THREE DIFFERENT TRAINING COURSES AND ORIENTATION PROGRAMS FOR VARIOUS LEVELS OF PUBLIC SCHOOL PERSONNEL. THESE PROGRAMS WILL COVER THE CONCEPTS NECESSARY FOR THE EFFECTIVE INSTALLATION AND USE OF CAI IN A PUBLIC SCHOOL SYSTEM.

Orientation of teachers, supervisors, and administrators has been taking place and will continue throughout the project. The chapter "Staff Orientation, Development, and Responsibilities" details the progress in this area. Seven specific types of staff orientation have occurred:

1. A training course for teacher specialists
2. A training course for programmers
3. A training course for groups of supporting teachers who devote approximately 10 per cent of their time to the project
4. Orientation for classroom teachers in the project schools
5. Orientation discussions for principals and area director of the project schools
6. Orientation presentations and discussions for groups of administrators, supervisors, and other central office personnel
7. Informal orientation discussions for many teachers who have expressed an interest in the project through application for the various full-time and part-time positions which have been available since the start of the project

Objective B: THE CREATION OF A CADRE OF TECHNICAL AND PROFESSIONAL PERSONNEL (5 - 10) WITHIN MCPS CAPABLE OF TRANSLATING CAI INSTRUCTIONAL STRATEGIES INTO EITHER THE COURSEWRITER II OR APL COMPUTING LANGUAGE

Six teacher specialists and two programmers have been trained in both languages; one programmer has learned Coursewriter II. The systems manager and senior programmer came to the project with experience in the use of Coursewriter II and have learned A Programming Language (APL).

Objective C: THE CREATION OF A CADRE OF SIX TEACHER SPECIALISTS WHO ARE CAPABLE OF DEVELOPING INSTRUCTIONAL PACKAGES, FOR A GIVEN SUBJECT AREA, TO BE USED IN CONJUNCTION WITH THE COMPUTER

Following employment, six teacher specialists were trained and are developing modular instructional packages. Informal training continues.

Objective D: THE DEVELOPMENT OF AN EVALUATION DOCUMENT WHICH WILL REVIEW AND EVALUATE EXISTING CAI MATERIALS THAT ARE AVAILABLE AND ADAPTABLE TO PUBLIC SCHOOL USE ON THE IBM 1500 INSTRUCTIONAL SYSTEM

This objective will not be completely fulfilled until the end of the project. Plans for this review and evaluation are included in the curriculum development sub-plan, a part of the Master Plan. Active participation in the Association for the Development of Instructional Systems, visitations, and materials exchanges with other CAI installations are contributing to progress toward this goal.

Objective E: THE DEVELOPMENT OF A DOCUMENT WHICH WILL RELATE THE DETERMINATION AND DEFINITION OF THE APPLICATION OF CAI UTILIZING AN IBM 1500 INSTRUCTIONAL SYSTEM IN THE SCHOOL CLASSROOM SETTING AND PROJECT THIS APPLICATION TO DETERMINE AND DEFINE THE APPLICATION OF CAI WITHOUT PARTICULAR HARDWARE LIMITATIONS IN THE SCHOOL CLASSROOM SETTING. THIS ACTIVITY WOULD EVALUATE THE VARIOUS CAI INSTRUCTIONAL TECHNIQUES, RELATE THE USE OF THE COMPUTER TO OTHER INSTRUCTIONAL MEDIA, AND DETERMINE THE USE OF THE COMPUTER FOR OTHER ACTIVITIES

Progress toward this achievement has included the facility modification, the installation of the computer system with terminals in one school, initial development of modular instructional packages, and plans for lesson tryout and research programs.

Objective F: THE DESCRIPTION OF THE ROLE OF THE CLASSROOM TEACHER IN THE CAI-EQUIPPED SCHOOL SYSTEM AND IDENTIFICATION OF ADDITIONAL SKILLS THIS ROLE WILL REQUIRE

There were no specific efforts toward this goal in Phase I.

Objective G: THE PRODUCTION OF "MODULAR INSTRUCTIONAL PACKAGES" FOR USE ON THE IBM 1500 CAI SYSTEM

Twenty segments, including elementary arithmetic, senior high mathematics, junior high science, and senior high chemistry and physics content areas, have been brought to various stages of development.

Objective H: THE DESIGN AND DEVELOPMENT OF A PROGRAM TO DETERMINE THE FEASIBILITY OF USING THE IBM 1500 CAI SYSTEM FOR TESTING AND TEST DEVELOPMENT

This program has not yet been developed.

Objective I: THE DESIGN AND DEVELOPMENT OF A MODEL PLAN FOR INTRODUCTION AND USE OF CAI IN THE PUBLIC SCHOOL ENVIRONMENT

The model plan is the principal terminal objective of the project. Documentation has occurred as these events took place: planning, facility design and modification, staff orientation and development, and initial materials production.

Objective J: CREATION OF THE TECHNICAL UNDERSTANDING REQUIRED TO UTILIZE AND MAINTAIN THE HARDWARE OF THE IBM 1500 CAI SYSTEM

A technical staff, including a systems manager and senior programmer, both with previous experience in using the system, has been working since just prior to the computer installation. In addition, the leasing arrangement with IBM provides for maintenance.

Objective K: DISSEMINATION OF INFORMATION ON FINDINGS OF THE PROJECT

This annual report is the principal dissemination vehicle for findings of the project to date. Flyers on design team activity and project objectives and correspondence with other installations have also been used for information exchange.

PROJECT PHASES AND PHASE I REPORT

Designs for fulfillment of project activities include three major project phases:

Phase I - June 1, 1968, to June 26, 1969

Development and Staff Orientation (Planning, In-service Training, Setting Up the CAI Facility and the Laboratory Situation)

Phase II - June 27, 1969, to June 26, 1970

Tryout, Adaptation, Research and Evaluation, Testing and Test Development, and Creation and Production of Prototype Modular Instructional Packages

Phase III - June 27, 1970, to May 31, 1971

Continued Modular Instructional Package Development, Research and Evaluation, Redesign of the Staff Orientation Programs and Evaluation of the Impact of the Revised Program, Development of a Model Plan for Incorporating CAI into a Large School System, Report Writing and Dissemination

Phase I Activities

Four groupings of activities were identified as major tasks for Phase I: Activities prior to installation of equipment, activities immediately subsequent to delivery of equipment, program development, and initiation of project activities.

Prior to the installation of equipment, the project staff was selected and oriented, the Master Plan and some of its sub-plans were developed, and the facilities modification was performed. Chapters of this report are devoted to these topics.

Immediately subsequent to delivery of the equipment, the installation and "debugging" of the system occurred; and members of the project staff were trained in the operation of the equipment.

Program development included design and initiation of orientation programs for task forces and teaching personnel (described in the staff orientation chapter) and initiation of production of programs in Coursewriter II and APL.

Initiation of project activities included the survey of available CAI software and some tryout of such material.

Many activities initiated in Phase I will continue for the duration of the project.

SUMMARY OF INTRODUCTION

Remote time-shared computer terminals in an elementary school and a senior high school, cable-connected to a computer and its peripheral equipment to form an IBM 1500 Instructional System, are being used to assist teachers in assuring student attainment of specific objectives through the individualization of the instructional process. The research into the Feasibility of Learning Employing Computer Technology is funded under Title III, E.S.E.A. of 1965, with support from the Montgomery County (Maryland) Public Schools. Phase I of the three-year project, funded and initiated in June, 1968, included planning, staff orientation, development and training, modular instructional package development, and the setting up of the CAI facility and the laboratory situation. Phases II and III will include research activities, evaluation, and documentation of findings as well as the continuation of activities initiated in Phase I. The principal terminal objective of the project is the production of a document which will contain specifications for the initiation, development, and evaluation of a model plan using Computer-Assisted Instruction in a large public school system.

PLANNING

Contributors

William M. Richardson

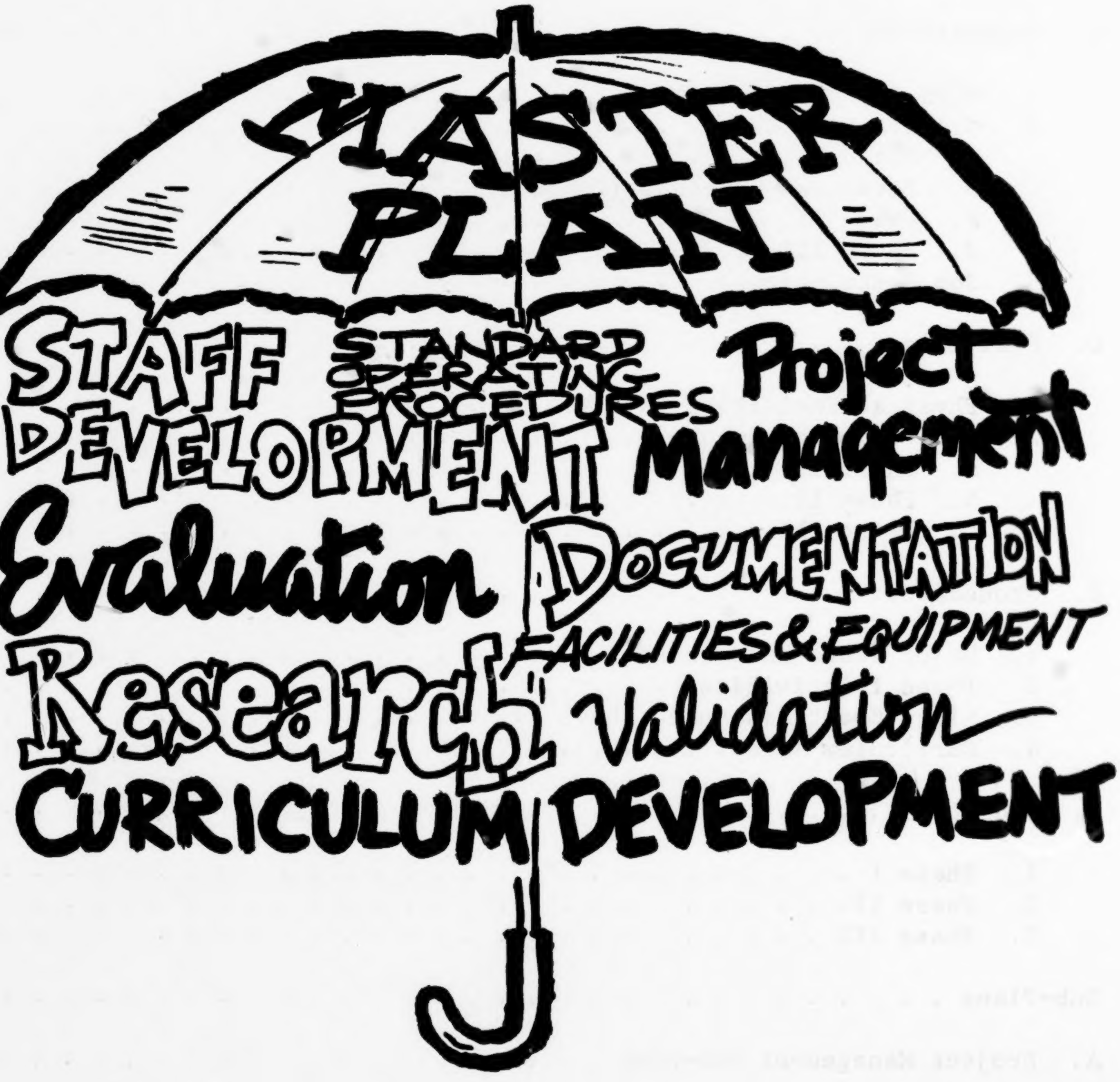
B. Jean Wastler

OVERVIEW

An instructional technology as complex as Computer-Assisted Instruction requires a tremendous amount of advance planning if it is to be effectively utilized. The project director, through the development of the Master Plan, provided a means of properly planning the activities to insure that the objectives are accomplished in accordance with the proposal, that all components of the project are given adequate and proper attention, and that proper evaluation of the project is achieved. Various sub-plans, developed independently, each focus attention upon a vital component of the CAI Demonstration Project. This chapter contains a description of and excerpts from the Master Plan and the sub-plans produced during Phase I. These documents identify resources, plans, activities, and events necessary for the attainment of the project objectives.

MASTER PLAN

The first draft of the Master Plan, designed to serve as a template for project activities for the three-year period, was completed in July, 1968. Following a project narrative, the project organization, facilities, procedures, budget, and sub-plans to be produced were specified. One of the first items developed in the plan was the restatement of project objectives in measurable terms to facilitate the process of project management and evaluation. Organization and contents of the Master Plan have been periodically reviewed. Revisions, intended to improve the final accomplishments of the project, have been made.


MASTER PLAN
STAFF DEVELOPMENT
STANDARD OPERATING PROCEDURES
Project Management
Evaluation
DOCUMENTATION
FACILITIES & EQUIPMENT
Research
Validation
CURRICULUM DEVELOPMENT

Excerpts from the Master Plan are included in the following paper to serve as indications of the planning accomplished.

(Excerpt from Master Plan, July, 1968)

CAI MASTER PLAN

Table of Contents

Page

I. Project Narrative 1

II. General Background and Planning 3

A. Introduction. 3

B. Project Objectives. 4

C. Organization. 6

1. MCPS Organization Chart 6
2. Organization Chart. 7
    a. Phase I 7
    b. Personnel Schedule (Phase I). 8
    c. Phase II. 9
    d. Phase III 9
3. Job Descriptions. 10

D. Facilities. 11

1. Physical Facilities Layout. 11
2. CAI Equipment Schedule. 12
    a. Phase I 12
    b. Phase II. 13
    c. Phase III 14

E. Procedures. 15

1. Major Tasks Each Phase. 15
2. Phase I Activities. 17
3. Micro Event Schedule (Phase I). 18
4. Curriculum Areas. 20

F. Budget. 21

1. Phase I 21
2. Phase II. 24
3. Phase III 27

III. Sub-Plans 30

A. Project Management Sub-plan 30

B. Curriculum Development Sub-plan 31

C. Research Design Sub-plan. 32

Page
D. Staff Development Sub-plan. 32

E. Standard Operating Procedures (Computer). 33

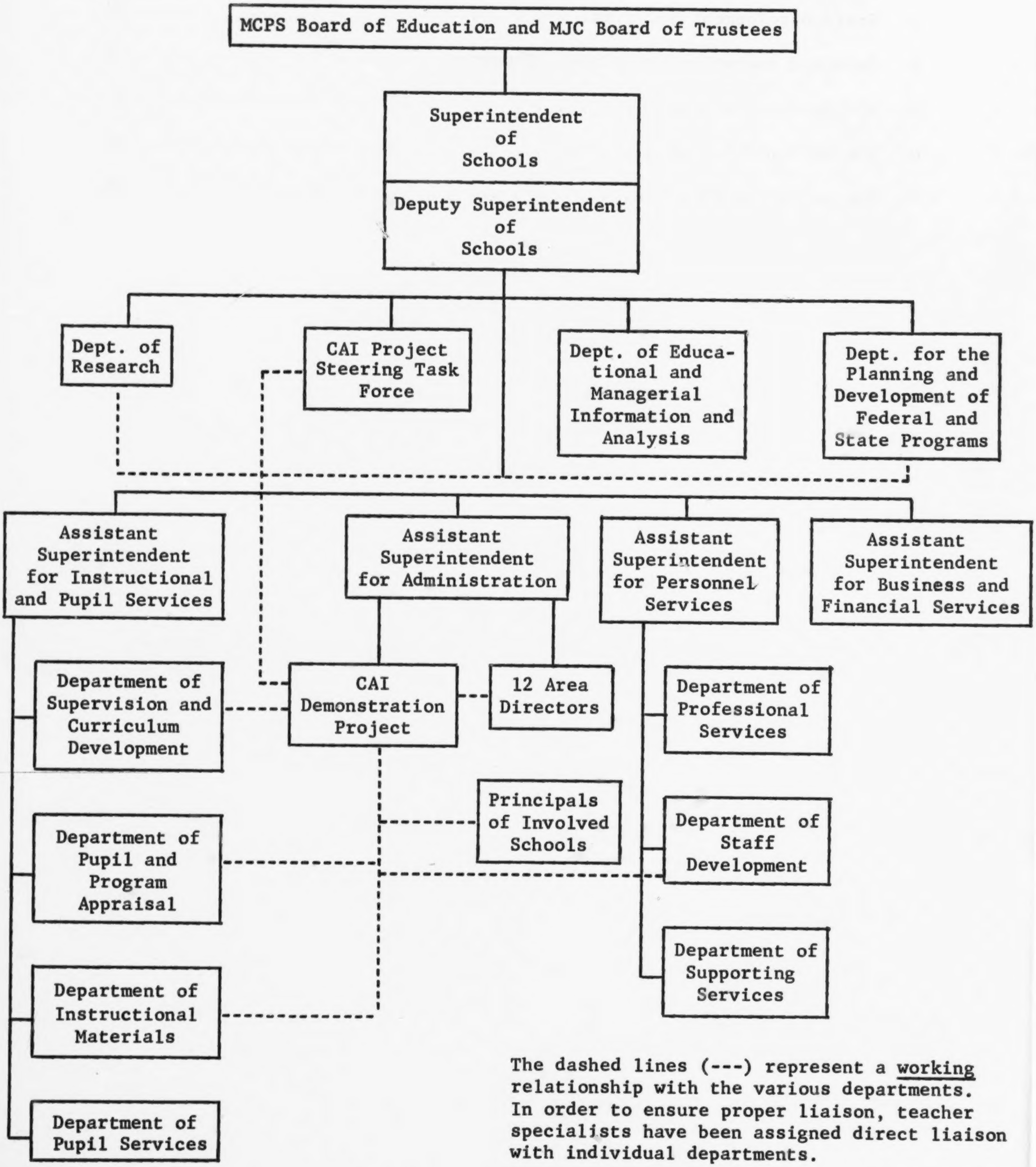
F. Validation Sub-plan 33

G. Evaluation Sub-plan 34

H. Documentation Sub-plan. 34

The two following organization charts identify relationships between the project and MCPS departments and individuals, and relationships within the CAI staff.

(Excerpt from Master Plan, July, 1968)

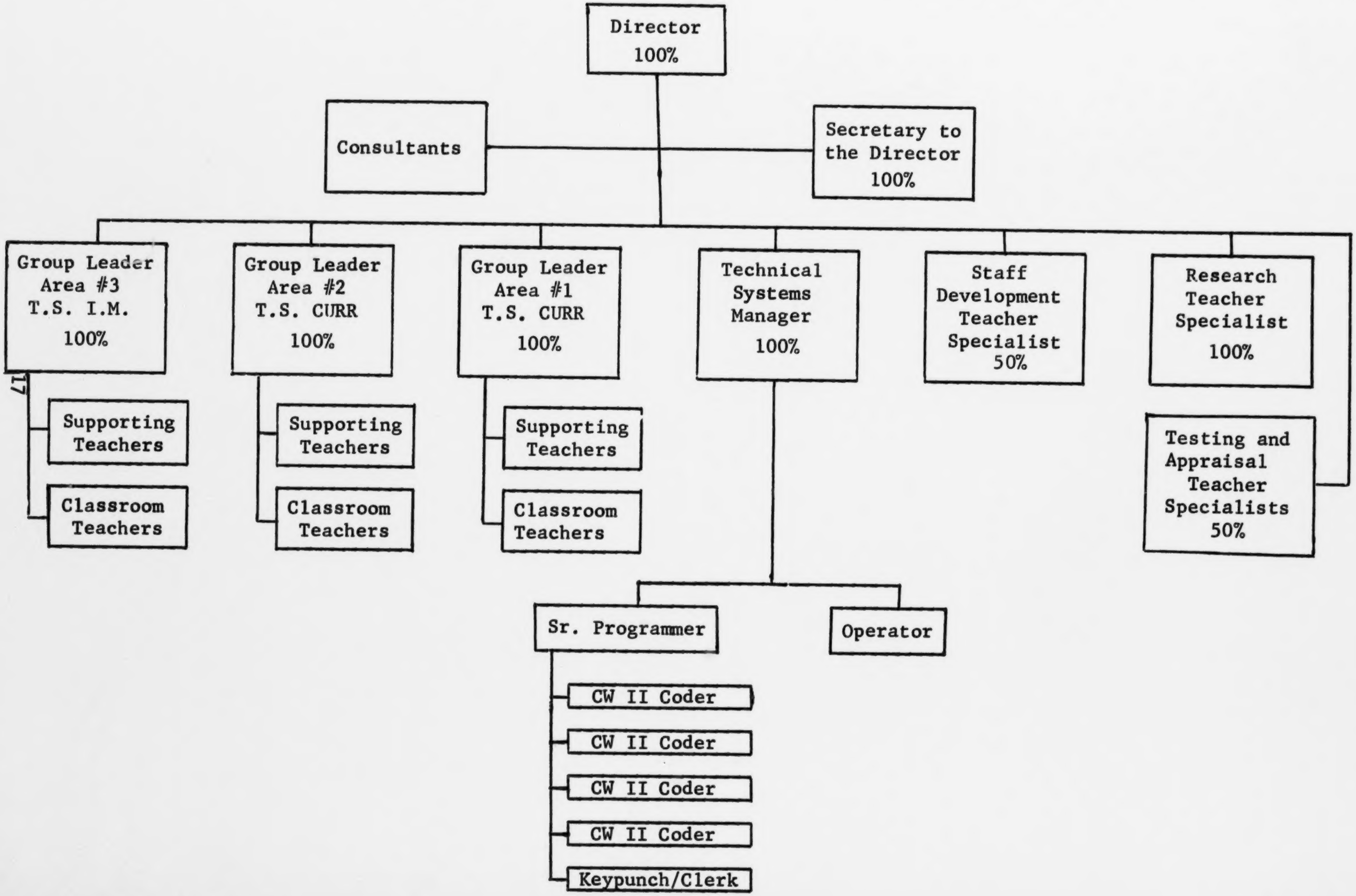

MCPS Board of Education and MJC Board of Trustees
Superintendent of Schools
Deputy Superintendent of Schools
Dept. of Research
CAI Project Steering Task Force
Dept. of Educational and Managerial Information and Analysis
Dept. for the Planning and Development of Federal and State Programs
Assistant Superintendent for Instructional and Pupil Services
Assistant Superintendent for Administration
Assistant Superintendent for Personnel Services
Assistant Superintendent for Business and Financial Services
Department of Supervision and Curriculum Development
CAI Demonstration Project
12 Area Directors
Department of Professional Services
Principals of Involved Schools
Department of Pupil and Program Appraisal
Department of Staff Development
Department of Instructional Materials
Department of Supporting Services
Department of Pupil Services

The dashed lines (---) represent a working relationship with the various departments. In order to ensure proper liaison, teacher specialists have been assigned direct liaison with individual departments.

(Excerpt from Master Plan July, 1968)

CAI PROJECT ORGANIZATION

(Phase I)


Director 100%
Consultants
Secretary to the Director 100%
Group Leader Area #3 T.S. I.M. 100%
Supporting Teachers
Classroom Teachers
Group Leader Area #2 T.S. CURR 100%
Supporting Teachers
Classroom Teachers
Group Leader Area #1 T.S. CURR 100%
Supporting Teachers
Classroom Teachers
Technical Systems Manager 100%
Sr. Programmer
Operator
CW II Coder
CW II Coder
CW II Coder
CW II Coder
Keypunch/Clerk
Staff Development Teacher Specialist 50%
Research Teacher Specialist 100%
Testing and Appraisal Teacher Specialists 50%

In order to optimize effective use of personnel and equipment, personnel were task-phased and equipment was utilization-phased. The effectiveness of this planning was apparent; at the time the equipment became operational, the personnel were ready to put it to use.

(Excerpt from Master Plan, July, 1968)

CAI PROJECT PERSONNEL SCHEDULE

Phase I June 68 - May 69

		1	5	4	4	5	4	4	5	4	4	5	4
Position	No. of Positions	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY
Director	1	6-21 -	------	------	------	------	------	------	------	------	------	------	------
Sec. to Director	1		7-15--	------	------	------	------	------	------	------	------	------	------
T. S. Curr	1		7-29--	------	------	------	------	------	------	------	------	------	------
T. S. Curr	1			8-19--	------	------	------	------	------	------	------	------	------
T.S. Instr. Mat'l	1			8-19--	------	------	------	------	------	------	------	------	------
T.S. Research	1				9-1---	------	------	------	------	------	------	------	------
T.S. Staff Dev.	1			8-19--	------	------	------	------	------	------	------	------	------
T.S. Testing								12-15--	------	------	------	------	------
Systems Manager	1					10-1-	------	------	------	------	------	------	------
Sr. Programmer	1							12-1---	------	------	------	------	------
Operator	1									2-1--	------	------	------
C.W. Coder #1	1								1-1--	------	------	------	------
C.W. Coder #2	1								1-1--	------	------	------	------
C.W. Coder #3	1								1-1--	------	------	------	------
C.W. Coder #4	1								1-1--	------	------	------	------
Keypunch/Clerk										2-1--	------	------	------

(Excerpt from Original Master Plan, July, 1968, has been updated)

D. Facilities
   2. CAI Equipment Schedule

CAI EQUIPMENT SCHEDULE

Phase I June 68 - May 69

Equipment	Equipment Location	Monthly Rental	No. of Months	No. of Units	Total Cost Phase I	NOV	DEC	JAN	FEB	MAR	APR	MAY
1131 C.P.U.	Einstein H. S.	$2,586	4	1	$10,344				X	X	X	X
1133 Multiplexer	Einstein H. S.	750	4	1	3,000				X	X	X	X
1442 Read Punch	Einstein H. S.	265	4	1	1,060				X	X	X	X
1132 Printer	Einstein H. S.	268	4	1	1,072				X	X	X	X
2310 Disk Drives	Einstein H. S.	435@	4	2	3,480				X	X	X	X
2415 Tapes	Einstein H. S.	775	4	1	3,100				X	X	X	X
1502 Station Control	Einstein H. S.	1,375	4	1	5,500				X	X	X	X
1518 Typewriter	Einstein H. S.	90@	4	4	1,440				X	X	X	X
1518 Typewriter	Newport J. H. S.	90@	4	3	1,080				X	X	X	X
1512 CRT	Newport J. H. S.	77@	4	3	924				X	X	X	X
1512 CRT	Einstein H. S.	77@	4	3	924				X	X	X	X
1510 Image Projector	Einstein H. S.	90	4	1	360				X	X	X	X
1510 Image Projector	Newport J. H. S.	90	4	1	360				X	X	X	X
029 Keypunch	Einstein H. S.	69	4	1	276				X	X	X	X
Total Rental Per Month		$8,230	Total Rental		$32,920							
2315 Disk Cartridges -- purchased 10 at $90@					900							
				TOTAL	$33,820							

The major tasks to be performed in each phase of the project were identified. Working from these tasks, a hierarchy of required activities for each phase was constructed; and a Program Evaluation and Review Technique (PERT) network was then developed.

(Excerpt from Master Plan, July, 1968)

E. Procedures

1. Major Tasks

PHASE ONE: (June, 1968 - May, 1969)

Prior to Installation of Equipment

a. Selection and orientation of project staff.
b. Development of the master plan.
c. Development of sub-plans.
d. Perform facilities modification.

Immediately Subsequent to Delivery of the Equipment

a. Installation and "debugging" of system.
b. Training of project staff in the operation of the equipment.

Program Development

a. Development and initiation of orientation programs for task forces and teaching personnel.
b. Gathering of research data on teacher reaction and student attitudes toward CAI.
c. Initiation of programs in Coursewriter II.

Initiation of Project Activities to survey and try out available CAI software and to design research activities to evaluate outcomes and study the learning process

Initiation of Activity to Define Issues Inherent in the Classroom Use of CAI That Will Require Research and Development Activities.

(Note: Activities initiated in Phase I will be continuous throughout the life of the project.)

PHASE TWO: (June, 1969 - May, 1970)

Continuation of Try-out and Evaluation of Available "Software" for Use with Elementary and Secondary Students

Initiation of Activities to Produce Prototype "Modular Instructional Packages" in Terms of Local Curriculum Needs

Initiation of the Feasibility Studies on the Use of CAI for Educational Diagnosis

Development of Research to Study the Human Factors Issues and Learning Process Issues with Students Exposed to CAI

Initiation of Studies of the Feasibility of Using CAI Equipment and Procedures for Test Development and Test Administration

PHASE THREE: (June, 1970 - May, 1971)

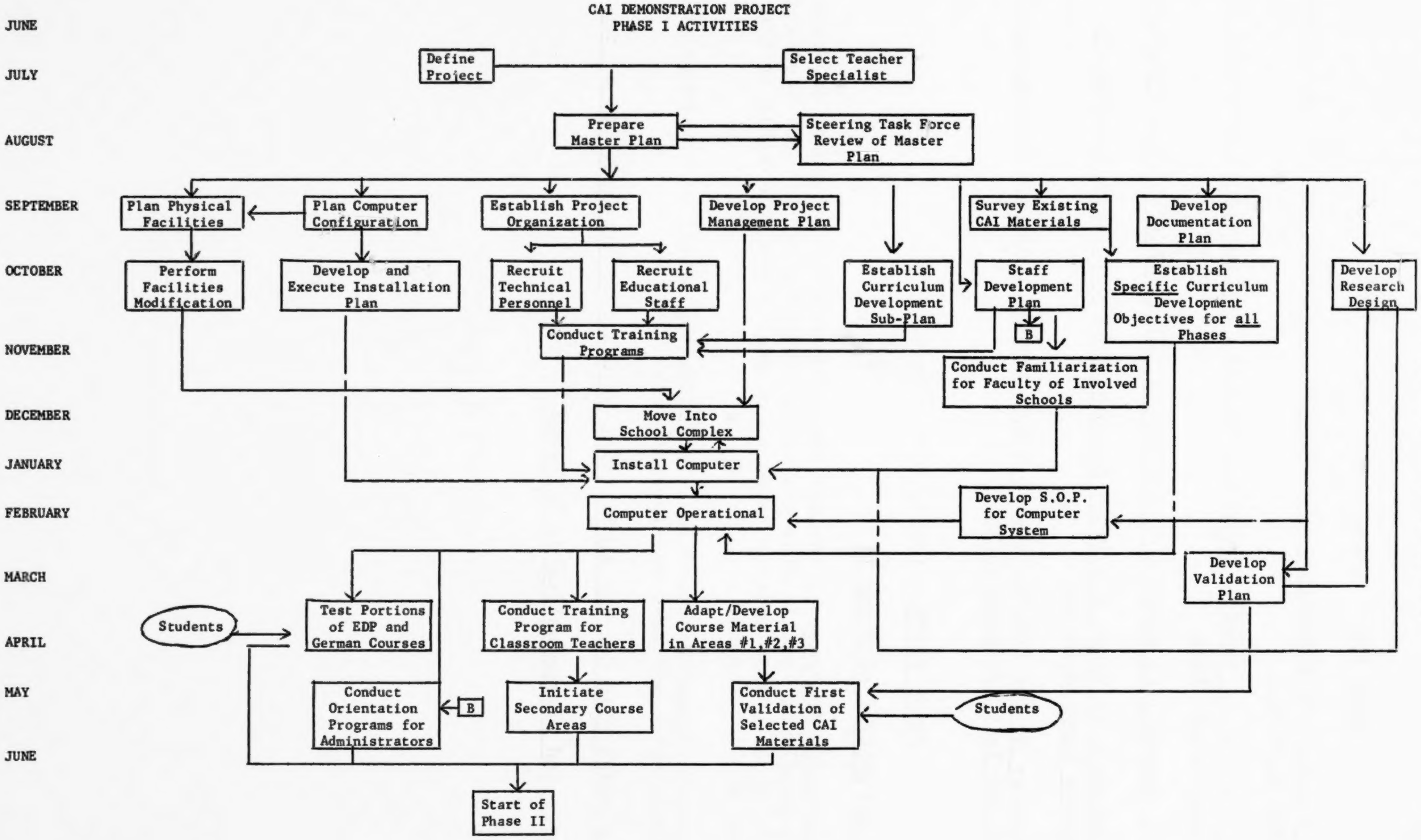
Continuation of Activities of Phase II

Redesign of Orientation Program, to include the demonstration of use by students of CAI materials developed locally (the prototype modular instructional packages) and the materials from outside sources found to be usable and applicable in the Montgomery County Public Schools.

Analysis of Data from Research Activities, including the impact of the redesigned staff orientation program and test development activities.

Development of a Model Plan for the Application of CAI in a Total School System

Writing of Reports and Dissemination of Findings



CAI DEMONSTRATION PROJECT
PHASE I ACTIVITIES

JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
Define Project
Select Teacher Specialist
Prepare Master Plan
Steering Task Force Review of Master Plan
Plan Physical Facilities
Plan Computer Configuration
Establish Project Organization
Develop Project Management Plan
Survey Existing CAI Materials
Develop Documentation Plan
Perform Facilities Modification
Develop and Execute Installation Plan
Recruit Technical Personnel
Recruit Educational Staff
Establish Curriculum Development Sub-Plan
Staff Development Plan
Establish Specific Curriculum Development Objectives for all Phases
Develop Research Design
Conduct Training Programs
B
Conduct Familiarization for Faculty of Involved Schools
Move Into School Complex
Install Computer
Develop S.O.P. for Computer System
Computer Operational
Develop Validation Plan
Students
Test Portions of EDP and German Courses
Conduct Training Program for Classroom Teachers
Adapt/Develop Course Material in Areas #1,#2,#3
Conduct Orientation Programs for Administrators
B
Initiate Secondary Course Areas
Conduct First Validation of Selected CAI Materials
Students
Start of Phase II

(Excerpt From Master Plan, July, 1968)

Figure II. 1 Activities Hierarchy

(Excerpt from Master Plan, July, 1968)

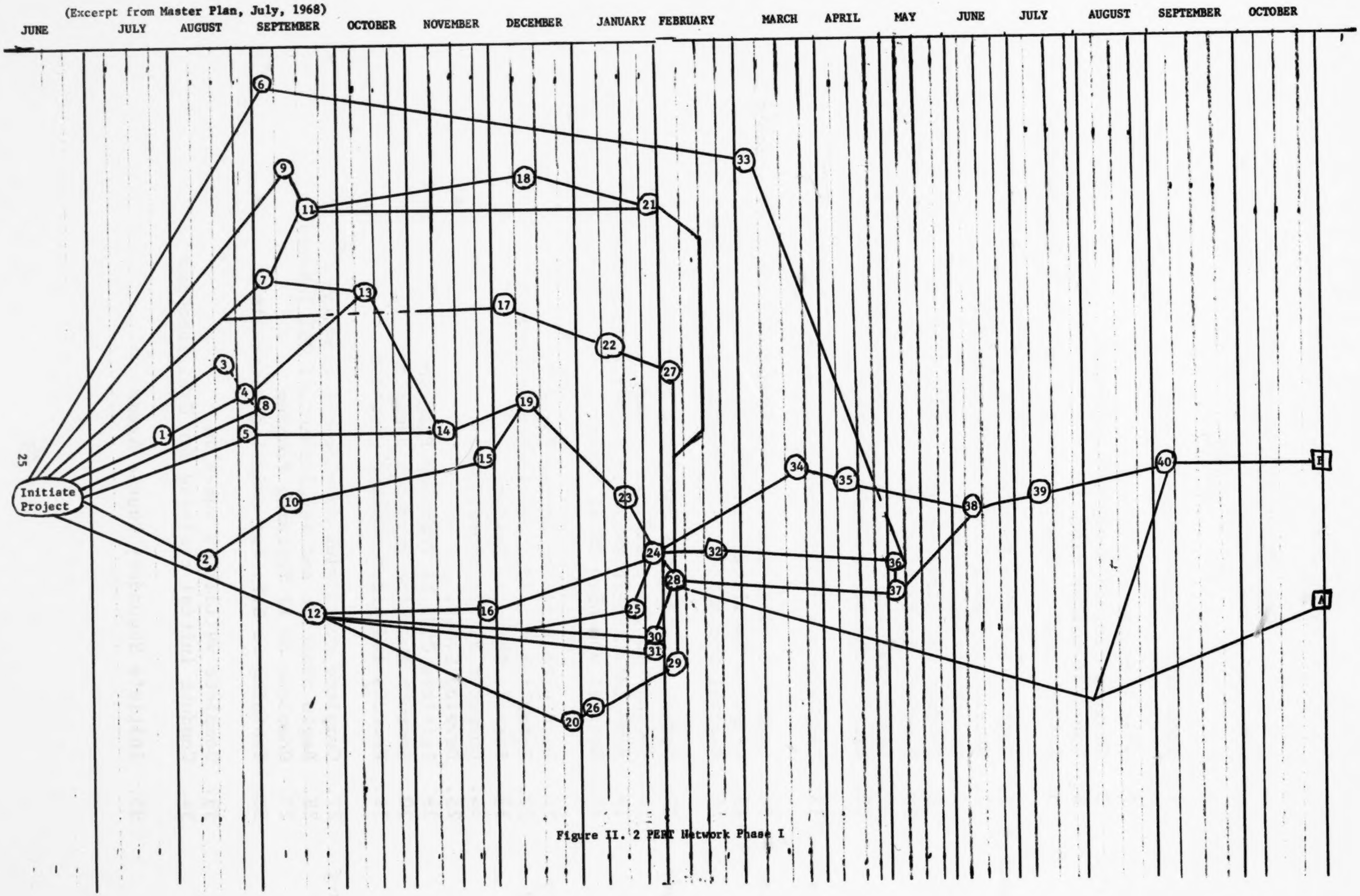

JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
Initiate Project
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
B
A

Figure II. 2 PERT Network Phase I

(Excerpt from Master Plan, July, 1968)

Micro-Event Schedule Phase I

CAI DEMONSTRATION PROJECT

MONTH	EVENTS
July	1. Establish project organization
August	2. Plan computer configuration
	3. Develop project management sub-plan
	4. Complete master plan
	5. Conduct familiarization for faculty of involved schools
September	6. Recruit and hire Research T.S.
	7. Recruit and hire Staff Development T.S.
	8. Documentation sub-plan
	9. Recruit and hire resource teachers
	10. Complete facilities plan
	11. Begin training course for resource teachers
	12. Recruit and hire systems manager
October	13. Complete staff development sub-plan
November	14. Conduct familiarization for faculty of involved schools
	15. Complete facilities modification
	16. Recruit and hire senior programmer
December	17. Survey existing CAI materials
	18. Recruit and hire T.S. in testing
	19. Move into Albert Einstein Senior High School
	20. Recruit and hire CW II Coders
January 1969	21. Terminate training course for R.T.
	22. Establish specific curriculum objectives
	23. Install Computer System
	24. Computer System operational
	25. Develop S.O.P.
	26. Initiate C.W. II Training Program
	30. Recruit and hire keypunch operator
	31. Recruit and hire computer operator
February	27. Complete curriculum development sub-plan
	28. Begin adoption and development of CAI lessons
	29. Complete CW II Training Program
	32. Training of C.T. for existing materials
March	33. Complete validation sub-plan
	34. Conduct initial training for C.R. Teachers
April	35. Initiate Secondary Course Areas

May	36.	Test portions of existing CAI materials
	37.	Begin validation of selected CAI lessons
June	38.	Complete first validation
July	39.	Evaluate results of first validation
September	40.	Begin second validation

At six-month intervals, the project PERT (Program Evaluation and Review Technique) network is revised for the next year. This system of updating provides for a six-month overlap for planning purposes; at six-month intervals plans are made for the forthcoming six months and, in broader terms, for the period six to twelve months ahead.

SUB-PLANS

Objectives of the Master Plan are to be accomplished through the development of various sub-plans, each focusing attention on a vital component of the project. Each sub-plan and its accompanying PERT network was developed independently but with the realization that each must be coordinated with the other sub-plans and components of the Master Plan. Although the ultimate responsibility for the Master Plan lies with the project director, other members of the project staff have shared responsibilities for the design of various sub-plans related to their staff assignments.

Project Management Sub-Plan

Documentation of the policies, procedures, and administrative processes that are essential for the effective management of such a project is the purpose of the Project Management Sub-Plan. The sub-plan sets forth a system for ensuring that responsibilities are delineated and that a means of communicating the described responsibilities and authorities is established. The Project Management Sub-Plan consists of a Project Data Book which contains

1. Organizational functions and responsibilities including establishment of a CAI Steering Task Force Committee and procedures of reporting to the superintendent of schools of Montgomery County
2. A formal system of communication between the project director and the responsible authorities within MCPS
3. A formal system of communication between MCPS and authorities outside MCPS
4. A formal system of cummunication between the project director and his staff

William M. Richardson, project director, prepared the Project Management Sub-Plan in August, 1968. The table of contents is indicative of the planning designed to maintain the necessary communications, direction, and control of the CAI project. The Project Data Book serves as a means of communicating project data to higher levels of administrative authority so that they may review and evaluate the progress of the project.

Project Data Book

Index

1.0 Introduction

- 1.1 Purpose
- 1.2 Content
- 1.3 Distribution

2.0 Levels of Administration

- 2.1 Steering Task Force
- 2.2 Primary Account Manager
- 2.3 Project Director

3.0 Communication Outside Montgomery County Public Schools

- 3.1 U.S. Office of Education
- 3.2 Maryland State Department of Education

4.0 Communications Within Montgomery County Public Schools

- 4.1 Monthly Progress Reports
- 4.2 Reports to Steering Task Force
- 4.3 Reports to Superintendent
- 4.4 Annual Report to Board of Education
- 4.5 Notes of Meetings
- 4.6 Memorandum to Assistant Superintendent for Administration
- 4.7 Memorandum to Individual Members of Steering Task Force

5.0 Communications Within Project Staff

- 5.1 Memorandum to Staff
- 5.2 Memorandum to Director
- 5.3 Minutes of Staff Meetings
- 5.4 Reports of Other Meetings
- 5.5 Routing Slip

6.0 Financial Accounting System

- 6.1 Phase I Budget
- 6.2 Movement of Funds Authorization

6.3 Monthly and Year-to-Date Expenditures
6.4 Expenditures Per Account Number

7.0 Personnel Accounting

7.1 Personnel Listing
7.2 Personnel Activity Chart

(Excerpt, Project Management Sub-Plan, August, 1968)

2.0 Levels of Administration

2.1 Steering Task Force

2.1.1 Membership

Dr. Donald J. Miedema, Deputy Superintendent of Schools
Dr. Joseph J. Tarallo, Assistant Superintendent for Administration
Dr. Samuel M. Goodman, Director of Department of Research
Dr. Elizabeth C. Wilson, Director of Supervision and Curriculum Development
Dr. James D. Morgan, Director of Pupil and Program Appraisal
Dr. Richard L. Darling, Director of Instructional Materials
Dr. Charles M. Proctor Jr., Director of Department of Staff Development
Dr. James W. Jacobs, Director of DEMIA
Mr. William C. Feddeman, Director of Planning and Development of Federal and State Programs
Mrs. Ruth S. Gue, Director of Area 6
Mr. Thomas A. Conlon Jr., Principal of Albert Einstein High School
Mr. James B. Williams, Principal of Newport Junior High School
Mr. Richard B. Reese, Principal of Pleasant View Elementary School
Mr. William M. Richardson, Director of CAI Demonstration Project

2.1.2 Function

The purpose of the Steering Task Force is to ensure that the CAI Demonstration Project reflects the coordinated thoughts and strengths of the MCPS system in the areas of administration, research, supervision and curriculum, pupil and program appraisal, instructional materials, educational and managerial information and analysis, and staff development. The Steering Task Force will review the broad scope direction and planning of the CAI project and recommend areas of emphasis that will guide the project towards its ultimate objectives. This Task Force will also perform the function of providing the project director with coordinated assistance in those areas of the project which warrant attention.

2.1.3 Activities

It is anticipated that the Steering Task Force will meet quarterly at the direction of the assistant superintendent for administration, the chairman ex officio. The project director will prepare a brief progress report for each meeting and allow sufficient time for discussion of critical issues.

2.2 Primary Account Manager

The project director will be designated as the secondary account manager and will report directly to the assistant superintendent for administration, the primary account manager.

2.3 Project Director

The project director will be responsible for providing general and specific direction to the project. This direction is as follows:

a) Focused upon the following areas in coordination with the assistant superintendent for administration and the Steering Task Force:
   (1) Planning the accomplishments of the project and procuring the resources necessary to meet these objectives

   (2) Providing assistance, liaison, and direction to the curriculum development aspects of the project

   (3) Selecting, training, and orienting both technical and educational personnel

   (4) Financially managing the project as secondary account manager

   (5) Designing facilities, planning resources, and operating equipment

b) Liaison with the Executive Staff, department heads, and the administrative and supervisory personnel to coordinate the activities of the project in order to meet the needs and desires of all components of Montgomery County Public Schools

c) Liaison with organizations and personnel outside Montgomery County Public Schools to ensure that proper coordination is maintained with other CAI projects

- -

The Project Data Book is to be updated as the project proceeds and will be used as an aid in the terminal objective fulfillment, the development of the model plan.

Curriculum Development Sub-Plan

Purpose of this sub-plan is formal documentation of the means and procedures that are used by the project staff to adapt and develop CAI materials for use in the project. This sub-plan establishes the roles and responsibilities of each member of the curriculum development team, i.e., the lesson author, the design team leader, the systems manager, the instructional programmers, etc. It is anticipated that these procedures will change as the staff acquires greater experience in CAI lesson development. This sub-plan documents all aspects of CAI curriculum development such as:

1. Various CAI instructional techniques
2. Criteria for applying these various CAI techniques
3. Application of CAI to subject matter areas
4. CAI media selection criteria
5. Application of CAI to grade level
6. Criteria for determining what constitutes effective CAI materials

Teacher-specialist in Curriculum Catherine E. Morgan prepared the Curriculum Development Sub-Plan in January, 1969. Many of the specific procedures established by the sub-plan are described in the "Modular Instructional Package" chapter of this annual report.

(Excerpt, Curriculum Development Sub-Plan, January, 1969)

TABLE OF CONTENTS

I. Introduction

II. Background Information

A. Project Purposes

B. Project Philosophy

C. Curriculum Design - Montgomery County

D. Assumptions and Biases

III. Development of Instructional Modules

A. Guidelines for Choice of Module

B. Development Procedures

C. Implementation of Module in School Program

D. Evaluation of Module

IV. Survey and Study of CAI Materials Generated by Other Institutions

A. Procurement of CAI Materials

B. Criteria for Selection

C. Adaptation Procedures

D. Evaluation

V. Roles in Curriculum Development

A. Project Staff

B. Design Teams

C. Involved Schools Personnel

D. Others

VI. Apercu (Brief survey as there are no conclusions at this time.)

Appendices

Form A	Suggested Format for Proposal
Form B	Evaluation Form
Form C	Time and Cost Requirements for Review and Adaptation
Form D	Checklist for Review of CAI Materials
Form E	List of All Sequences in a Subject Area Being Developed and Status of Their Development
Form F	Example of Flowchart for Sequence
Form G	Time Chart for Development of A Sequence

(Excerpt, Curriculum Development Sub-Plan, January, 1969)

II. Background Information

A. Project Purposes

The objectives of the project are clearly delineated in the project proposal and have been restated in more explicit, measurable terms in the master plan. As this sub-plan is concerned with curriculum, the objectives directly related to curriculum will be discussed herein. Specifically, the plans for reaching the following objectives will be detailed:

1. The development of an evaluation document which will be the vehicle by which review, evaluation, and use of existing CAI materials that are available and adaptable to public school use on the IBM instructional system. (III)

2. The development of a document which will relate the determination and definition of the application of CAI, utilizing an IBM-1500 Instructional System in the school classroom setting, and project this application to determine and define the application of CAI without particular hardware limitations in the school classroom setting. This activity would evaluate the various CAI instructional techniques, relate the use of the computer to other instructional media, and determine the use of the computer for other activities. (IV)

3. The production of "modular instructional packages" for use on the IBM-1500 CAI system. (IV)

4. The design and development of a program to determine the feasibility of using the IBM-1500 CAI system for testing and test development. (IV)

In conjunction with the above, the major emphasis in the development of curriculum will be on the invention of creative techniques of instruction and on innovative methods as to their use.

B. Project Philosophy

The philosophy of the staff concerning individualization of instruction for students is inherent in all aspects of the curriculum development plans. Testing entering behaviors considered essential to acquiring new behaviors will help prevent subsequent student failure. Pretests on material to be presented preclude the possibility that a student will be subjected to instruction on knowledges and/or skills already learned. In the development of the strategy to be used for any unit, the student may be able to choose his own path through the segment as well as his own speed.

Further concern about individualization will be displayed in the use of the instructional packet in the school program. Experiences with students in classroom and laboratory situations will prescribe methods of implementation of CAI modules in a school setting.

The plan will also delineate the roles of the project staff, involved school personnel, and other individuals in the development, implementation, and evaluation of CAI curricular materials.

C. Curriculum Design - Montgomery County

For curriculum design in Montgomery County refer to Curriculum Design, Institutional Level, a MCPS publication, Bulletin No. 215, 1968.

- -

(Excerpt, Curriculum Development Sub-Plan, January, 1969)

III. Development of Instructional Modules

This section of the sub-plan will describe the choosing, developing, and evaluating modular units of CAI curriculum. Further, it will discuss the plans for the inclusion of the module in the instructional environment.

A. Guidelines for Choice of Module

Guidelines for the selection of specific units of course content within the curriculum will be developed. At the present time, arbitrary decisions reflecting the opinions of the director and the involved teacher specialist will be made using the following criteria:

1. Module will lend itself to using CAI techniques.
2. Materials will be developed which may require a variety of approaches for individual student needs such as different:
    a. Vocabulary levels
    b. Modes of learning
    c. Rates of learning
    d. Degrees of challenge
    e. Interests
    f. Entering behaviors
3. Consideration will be given to developing some units for which:
    a. Detailed item analysis will be useful to the teacher
    b. Diagnostic tests can be written
    c. Drill and practice exercises can be developed

After the choice of an instructional segment has been made, the teacher specialist or a member of his design team will file a proposal and forward to the director for approval.

B. Development Procedures

After the proposal has been approved, the following outline will be used for the development of the package.

1. Terminal objectives for the module will be written.
2. Enabling objectives will be written.
3. These objectives will be arranged into a hierarchy presumed to be valid.
4. Minimum entering measurable behaviors will be written with criterion tests for each.
5. Criterion tests for each objective will be written.
6. A pretest and a post test for the module will be prepared.
7. Instructional strategies will be developed by deciding on:
    a. One or more CAI techniques to be used
    b. The stimuli which will activate student response - visual (CRT and image projector), auditory (tape recorder, earphones), tactile (manipulatory equipment provided at the terminal)
    c. Any additional printed material the student should have in conjunction with the computer terminal
    d. Kinds of data on student performance to be accumulated for later analysis
8. The segment will be written.
9. Instructional materials will be prepared.
10. The unit will be coded.
11. The unit will be debugged.
12. The unit will be tested with a small number of students. Student reactions will be collected.
13. The units will be revised to take care of student reactions.
14. Evaluative techniques will be used to ascertain validity and reliability.

IV. Survey and Study of CAI Materials Generated By Other Institutions

A. Procurement of CAI Materials

The director of the project will make initial contact with other institutions to procure CAI materials. Using the guidelines for selection listed below, the director in conjunction with the teacher specialist in the subject area involved will make decisions about materials to be acquired for perusal.

B. Criteria for Selection

The following aspects of procurement and adaptation of available CAI materials will be explored:

1. Cost (if any)

2. Constraints on use

    a. Copyrights exist on the materials

    b. The use of the materials is dependent upon the requirement that no changes be made.

3. Suitability

    a. The materials are appropriate for use within the present MCPS curriculum.

    b. The materials are appropriate for trial within a course(s) in MCPS curriculum, but material is not presently taught.

    c. The materials represent the contents for a course not presently taught in MCPS.

4. Adaptability

    a. Changes will need to be made in instructional strategies because of differences in hardware and/or computer language.

    b. Changes will need to be made in the materials so they will be more useable for MCPS students.

    c. Consideration will be made as to the time required for adaptation by:

        (1) Curriculum specialist and/or members of his design team
        (2) Technical staff

    d. Cost of the above adaptations will be determined.

C. Adaptation Procedures

The teacher specialist and his design team will review the CAI materials procured and will specify plans for their use. Adaptation procedures will very closely follow the development procedures for original CAI packets as outlined in Section III of this sub-plan.

(Excerpt, Curriculum Development Sub-Plan, January, 1969)

FORM A

SUGGESTED FORMAT FOR PROPOSAL

Title Page

Montgomery County Public Schools
Rockville, Maryland

COMPUTER-ASSISTED INSTRUCTION
DEMONSTRATION PROJECT

PROJECT PROPOSAL: Title

Prepared by:	Submitted to:
Name of Author	William M. Richardson
Position	Director, CAI Demonstration Project
Date	

Page 1

A. INTRODUCTION
Need for packet within CAI Project

B. PURPOSE OF PACKET
Objective in Terms of Project's Goals

C. TERMINAL OBJECTIVES OF PACKET

D. DEVELOPMENT PROCEDURES
Step-by-Step Procedure with Attendant Time Schedule

E. INSTRUCTIONAL TECHNIQUES
Explain Nature of the Instruction
CAI
PI Materials
Teacher Instruction
Group Discussion
Audio-visual Materials, Etc.

Page 2

F. RESOURCE REQUIREMENTS
Facilities
Personnel
Instructional Materials

G. STUDENT PARTICIPATION
Who? Approximate Length of Time?
From Where?
How Many?
Credit? (If Applicable)
Grades?
Implementation Plans

H. EVALUATION

APPROVALS

Director
CAI Demonstration Project

Any other necessary approvals

Report on project after development, use, and evaluation should document each of items A-H with actual happenings, dates, and results. This would be submitted to the director within a specified time.

Research Design Sub-Plan

Means and procedures by which research data will be collected are to be established by the Research Design Sub-Plan. These procedures will be designed to allow the project to meet its various research objectives. The sub-plan will define the data to be collected, design the system for collecting the information and data, and define the procedures for evaluating the resulrs. The Research Design Sub-Plan is intended to provide a system which will allow the project to address such topics as

1. The effectiveness of staff orientation programs
2. Changes in teacher and student attitude toward CAI
3. The changing role of the classroom teacher
4. Use of CAI for scheduling purposes
5. Relationship of CAI to other instructional media
6. Research designs intended to probe learning concepts

The Research Design Sub-Plan is not intended to set the guidelines for the measurement of learning or the evaluation of the effectiveness of CAI lesson materials as these are specified in other sub-plans.

This sub-plan is to be produced by the Teacher-Specialist in Research by September, 1969.

Staff Development Sub-Plan

Complete project participation in the area of staff orientation to computer-assisted instruction and educational technology is set forth in the Staff Development Sub-Plan. It identifies all levels of orientation programs and defines the desired objectives for each level. The Staff Development Sub-Plan consists of the following programs:

1. Training courses for curriculum development teacher-specialists (course authors)

2. Training courses for supporting teachers

3. Orientation courses for involved resource teachers and supervisors

4. Orientation courses for involved classroom teachers

5. Orientation courses for administrative personnel

6. Orientation programs for teachers and supervisors not directly involved

Each program is designed to meet the various needs of MCPS personnel.

As prepared by the Teacher-Specialist in Staff Development, Kenneth A. Walter, in June, 1969, the sub-plan details the various levels of staff development activity indicated by the project proposal and identifies the training course and orientation programs in educational technology and computer-assisted instruction programs necessary to meet the project goals. When each program has been conducted, reviewed, revised, and validated, all materials pertaining to the program will be added to the Appendix of the Staff Development Sub-Plan. Details of programs described in the sub-plan are found in the chapter of this report titled "Staff Orientation, Development, and Responsibilities."

Technical Support Sub-Plan (Computer)

In order to ensure the effective operation of the computer system available to the project, the technical systems manager is to develop the Technical Support Sub-Plan. This sub-plan outlines all necessary administrative and computer documentation procedures. It establishes operating procedures and schedules, provides proper liaison with the Curriculum Development Sub-Plan, and addresses all topics concerned with the IBM 1500 computing system. The systems manager is currently compiling the document.

Validation Sub-Plan

The Validation Sub-Plan establishes the system by which the CAI materials adapted and/or developed within this project may be validated. This sub-plan provides the means by which the CAI materials will be tested and evaluated in respect to the student's ability to accomplish the desired objectives. Implementation of this sub-plan will not produce data which can be used to compare CAI techniques with other instructional methods; but, rather, it will provide data which will indicate whether or not students have accomplished the desired learning outcomes by fulfilling the objectives while experiencing CAI.

Staff responsibilities in validation, data collection procedures, and various other delineations of events and accountabilities are established by the Validation Sub-Plan, which was prepared by the Teacher-Specialist in Research, Irene D. Goding, in May, 1969.

(Excerpt, Validation Sub-Plan, May, 1969)

TABLE OF CONTENTS

Page

I. Objectives of Validation Sub-Plan 1

II. What Is Validation? 1

III. Variables Affecting Validity 2

IV. Tests 3

V. Criterion Levels 6

VI. Other Methods of Feedback on MIPs 6

VII. Staff Responsibilities in Validation 7

VIII. Data Collection 8

IX. Analysis 9

X. Validation of Adapted MIPs 11

XI. Appendices 12

  A. Planning and Construction of Test 12

  B. Validation Chart 13-14

  C. EP Identifier 15

  D. MIP Validation Information Sheet 16

(Excerpt, Validation Sub-Plan, May, 1969)

VII. STAFF RESPONSIBILITIES AND PROCEDURES IN VALIDATION

A. Curriculum Authors

1. Development of MIPs, as outlined in the curriculum development sub-plan
2. Careful construction of MIP test items, as outlined in Appendix A, to insure content validity
3. Informing teacher specialist in research of the following:

   (Appendix D)

   a. Characteristics of the student population that will be involved with validation
   b. Method(s) to be used in determining reliability
   c. When students will begin work on MIP (Beginning of data collection)
   d. When analysis procedures can begin (When student population has completed MIP)
4. Informing systems manager of the following:
   a. When students will begin work on MIP (Beginning of data collection)
   b. When analysis procedures can begin (When student population has completed MIP)

B. Technical Staff

1. Development of MIPs, as outlined in curriculum sub-plan
2. Data collection
3. Printouts used for analysis (at least two copies - one to MIP author, one to teacher specialist in research)
4. Making necessary revisions for curriculum authors

C. Teacher Specialist in Research

1. Development of validation sub-plan
2. Review of test items when MIP authors feel it is necessary

3. Working with systems manager to develop and review the analysis printouts
4. Working with MIP authors to determine what form of reliability will be used
5. Helping MIP authors to develop attitude questionnaires, etc., to go along with MIPs
6. Reviewing various analysis printouts for each MIP
7. Keeping an up-to-date account of all MIPs in the process of being validated and all MIPs that have been validated

(Excerpt, Validation Sub-Plan, May, 1969)

VIII. MIP DATA COLLECTION

A. The following data will be collected each time a student responds to a question as a part of the student performance record:

Time of day

Student Number

Course Number

Date

Ep Identifier - See Appendix C

Response Identifier - telling whether right, wrong, or unidentified

Latency-Time - time interval between presentation of question and student's response

Counters

Switches

Attitude Question Answers

Comments

Date, Sign Off, Label, and Total Time for Each Student

(Excerpt, Validation Sub-Plan, May, 1969)

IX. ANALYSIS

A. The technical staff will:

1. Generate Validation Chart A (Appendix B1) which shows the following:

    a. The total number of students (N) who worked through the MIP

    b. Ratio and per cent of the number of students who tried the item to the number of students who were presented the item

    c. Difficulty level 1. Ratio and per cent of the number of students who got the item correct to the number of students who tried the item

    d. Difficulty level 2. Ratio and per cent of the number of students who were presented the item

    e. The discrimination index. Number in upper third of class who got the item right (Ru) minus the number in the lower third of class who got the item right (R_1) divided by one half of the total number (T) of students included in the item analysis $\left(\frac{Ru-R_1}{1/2\ T}\right)$. As the index approaches 1.00, the item approaches the maximum positive discriminating power where all students in the upper third got the item right and all the students in the lower group got the item wrong. An item with no discriminating power results in an index of .00.

    f. Mean and standard deviation of latency time

2. Generate Validation Chart B (Appendix B2) which shows the following:

    a. Number of pretest, post-test, diagnostic, and instructional questions tried

    b. Percentage of students who got a certain per cent of questions correct for pretest, post-test, and instructional.

    c. Reliability coefficient of pretest

    d. Reliability coefficient of post-test

    e. Reliability coefficient of diagnostic test.

    f. Reliability coefficient of instructional questions

    g. Maximum, minimum, mean, and standard deviation of total student time on MIP.

3. Generate a printout of student comments and unidentified answers.

(Excerpt, Validation Sub-Plan, May, 1969)

B. The authors will:

  1. Receive the printouts of comments and unidentified answers and

    a. Review the comments and indicate the necessary changes to the technical staff

    b. Review all unidentified responses and indicate to the technical staff which of these responses he will add to the alternate correct or wrong answers

  2. Analyze the validation charts to determine:

    a. Which post-test questions were below the criterion level

    b. Which part of the MIP might need revision as indicated by wrong answers to question:

      (1) Students failing both pretest and post-test questions

      (2) Students passing pretest questions and failing post-test questions

    c. Which questions are not being used

    d. Questions on which the students run out of time

    e. If criterion level has been reached

    f. Reliability of tests

(Excerpt, Validation Sub-Plan, May, 1969)

APPENDIX C

EP IDENTIFIER

1/	Label					A	A/N	2/	
____	____	____	____	____	____	____	____	____	____
Course	Grade		MIP ID	Programmer's ID		MIP Objectives		Type of Question and Instruction	

1/ COURSE IDENTIFICATION

A	Arithmetic	J	Jean's Test	S	Science
B		K		T	Teachers Training (Sup
C	Chemistry	L	Language Arts	U	
D	Demonstration	M	Mathematics	V	
E	ESCP	N		W	
F	French	O		X	
G	Geography	P	Physics	Y	
H	History	Q		Z	Summer Math/Science
I		R			

2/

			Type of Instruction						
			Drill and Practice		Tutorial		Simulation		Problem Solving
Type of Test Question	Pretest		B		K		S		2
	Post-Test		D		M		U		4
	Diagnostic	E*	F	N*	O	V*	W	5*	6
	Instructional		H		Q		Y		8

*Entering Behavior

Counter will show test question format.

(Excerpt, Validation Sub Plan, May, 1969)

APPENDIX D

VALIDATION INFORMATION SHEET

COURSE ______________________

UNIT ______________________

MIP TITLE ______________________

AUTHOR ______________________

COMMENCEMENT DATE OF DATA COLLECTION

____

COMMENCEMENT DATE OF ANALYSIS PROCEDURES

____

COMPLETION DATE OF MIP VALIDATION

____

STUDENT POPULATION CHARACTERISTICS ______________________

____

____

TEST AND RELIABILITY METHOD

Type of Test	Reliability Method

NECESSARY REVISIONS

____

____

____

____

Evaluation Sub-Plan

Research evaluation procedures necessary to evaluate the effectiveness of the use of CAI materials and techniques are to be established by this sub-plan. Procedures to be detailed include those to be employed when the project reaches the stage of comparison of learning results of students exposed to CAI techniques with the results of their traditional instruction and with those students not exposed to CAI techniques. This sub-plan will establish control and experimental groups, outline the data to be collected, provide the system to accomplish these functions, and specify other procedures necessary to ensure that the results obtained are valid.

Responsibility for the development of this sub-plan has been placed with the Teacher-Specialist in Research; its completion is scheduled for January, 1970.

Documentation Sub-Plan

One of the major objectives of the project is the dissemination of information and findings of the project; the Documentation Sub-Plan was designed to ensure maintenance of adequate and timely publication. The sub-plan establishes the means, procedures, and schedules of dissemination which accommodate the schedule of planned project accomplishments.

Communications procedures within the project, the MCPS system, and outside MCPS are established in the Documentation Sub-Plan. The sub-plan was developed by the Teacher-Specialist in Instructional Materials, B. Jean Wastler, in October, 1968. Specific policies, plans, procedures, and responsibilities are established so that the Title III Act and its regulations are met; conformance to MCPS regulations regarding communications and policies is insured; and conveyance of accurate information, appropriately timed, in keeping with the project, is facilitated.

(Excerpt, Documentation Sub-Plan, October, 1968)

TABLE OF CONTENTS

I. Introduction

II. Data Collection and Record Keeping

- A. Need and Purposes
- B. Approximation of Time
- C. Calendar of Major Events
- D. Specific Program Aspects

III. Communication

- A. Liaison Responsibilities
  - 1. Within MCPS
  - 2. Outside MCPS
- B. General Policies
- C. Specific Policies
  - 1. Informal Exchanges
  - 2. Formal Presentations
- D. Distribution
- E. Design
  - 1. Required Documents, Recipients, and Timing
  - 2. Public Relations Communiques
    - a. Project Publications
    - b. Demonstrations
    - c. Visitations and Conferences
    - d. Information for MCPS Personnel
      - (1) Those Directly Involved
      - (2) Other Personnel
    - e. News Releases

        f. Publications and Presentations for Professional Audiences
        g. Publications and Presentations for Lay Audiences
        h. Correspondence

IV. PERT Chart

V. Appendix
    A. Expenditure of Time Form
    B. List of Some MCPS Regulations Related to Documentation
    C. Sample of Memorandum Requesting Approval of Article
    D. Format for Monthly Progress Report to Assistant Superintendent for Administration
    E. Sample Introductory Letter to CAI Director at Other Installation

(Excerpt, Documentation Sub-Plan, October, 1968)

D. Specific Program Aspects

Documentation of executive level phases will be the responsibility of the project director. Aspects of the project to be supported with data by the project director include financing and expenditure of funds, selection and initial orientation of project staff, and development of the master plan.

While final responsibility for all phases rests with the director, documentation of other aspects will initially be the task of the identified person. Facilities modification and performance, demonstrations, and special projects data will be collected and organized by the administrative assistant. Curriculum development and evaluation of available software support will be the province of the teacher specialist in mathematics curriculum. Documentation sub-plan and resource center substantiation will be by the teacher specialist in instructional materials. The teacher specialists in research, staff development, and testing will be responsible for their respective phases of the program from a time to be specified by the director (at the time of their employment); until such times are specified, the director or his designee will document these phases of the project.

(Excerpt, Documentation Sub-Plan, October, 1968)

III. Communications

A. Liaison Responsibilities

1. Within MCPS

Liaison with the Board of Education is to be effected by the project director through the superintendent of schools or the deputy superintendent of schools.

All communications with the superintendent, the deputy superintendent, assistant superintendents, directors of departments, area directors, and principals of involved schools are handled by the project director or persons he designates.

The teacher specialists have been charged with the responsibility for coordination of information in their particular fields and departments. For instance, liaison with the Department of Supervision and Curriculum Development is the duty of the teacher specialists in curriculum. Teacher specialists in instructional materials, research, testing, and staff development have similar tasks within their respective departments.

The administrative assistant coordinates information between the Department of School Facilities, the Division of Construction, and the project. Teacher specialist in mathematics curriculum is the liaison person for the Department of Supporting Services Personnel. The teacher specialist in instructional materials is to work with the Director of the Department of Information.

(Excerpt, Documentation Sub-Plan, October, 1968)

2. Outside MCPS

Communication with the County Council; other elected local, state, and national officials; and the state superintendent of schools is to be by the director through the superintendent of schools or the deputy superintendent of schools.

Liaison with the U. S. Office of Education and the Maryland State Department of Education is the project director's responsibility. These intercommunications are to be through the Department for the Planning and Development of Federal and State Programs.

Interchanges with staff of other CAI installations initiated by the MCPS CAI staff are to begin with director-to-director communication. The first response to CAI correspondence originating elsewhere is to be over the director's signature.

Parochial and private school liaison will be through the director until he identifies the staff member to be charged with this responsibility.

Liaison with professional organizations is to be effected by staff members belonging to the organizations or, if there are no members on the CAI staff, by the teacher specialist in instructional materials.

The director of the Department of Information serves as liaison officer for news media, agencies, organizations, businesses, and individuals in disseminating information about the MCPS.

Communication with the public or press instigated by them and not anticipated elsewhere in this sub-plan is within the sphere of the director.

(Excerpt, Documentation Sub-Plan, October, 1968)

REQUIRED PUBLICATIONS AND EVENTS SCHEDULE

October	1.	Initiate documentation plans
	2.	Begin preliminary draft of continuation grant
	3.	Prepare monthly report for assistant superintendent for administration
November	4.	Complete preliminary draft of continuation grant
	5.	Prepare monthly report for assistant superintendent for administration
December	6.	Review and revise continuation grant
	7.	Prepare report for Task Force Steering Committee
	8.	Complete final draft of continuation grant
	9.	Prepare monthly report for assistant superintendent for administration
January	10.	Send final draft of continuation grant to Department for the Planning and Development of Federal and State Programs
	11.	Begin preparation of first semi-annual report
	12.	Take continuation grant to Division of Publications
	13.	Prepare monthly report for assistant superintendent for administration
February	14.	Complete preliminary draft of first semi-annual report
	15.	Prepare monthly report for assistant superintendent for administration
	16.	Review and revise first semi-annual report
March	17.	Prepare report for Task Force Steering Committee
	18.	Prepare actual expenditures for grant period to date and estimated requirements to the end of grant period
	19.	Complete final draft of first semi-annual report
	20.	File actual expenditures for grant period to date and estimated requirements to the end of the grant period
	21.	Take first semi-annual report to the Division of Publications
	22.	Prepare monthly report for assistant superintendent for administration
April	23.	Distribute first semi-annual report
	24.	Begin making arrangements for audit
	25.	Prepare monthly report for assistant superintendent for administration
May	26.	Begin preparation of second semi-annual report
	27.	Prepare monthly report for assistant superintendent for administration
PHASE II		
June	28.	Prepare report for Task Force Steering Committee
	29.	Plan publications for the year
	30.	Complete arrangements for audit
	31.	Complete preparation of preliminary draft of second semi-annual report
	32.	Prepare monthly report for assistant superintendent for administration
	33.	Review and revise second semi-annual report

July 34. Complete final draft of second semi-annual report
35. Prepare list of publications for the year
36. Prepare actual expenditures of first grant period
37. Begin preparation of budget request (MCPS) for next fiscal year
38. Take second semi-annual report to Division of Publications
39. Prepare monthly report for assistant superintendent for administration
40. File actual expenditures for the first grant period

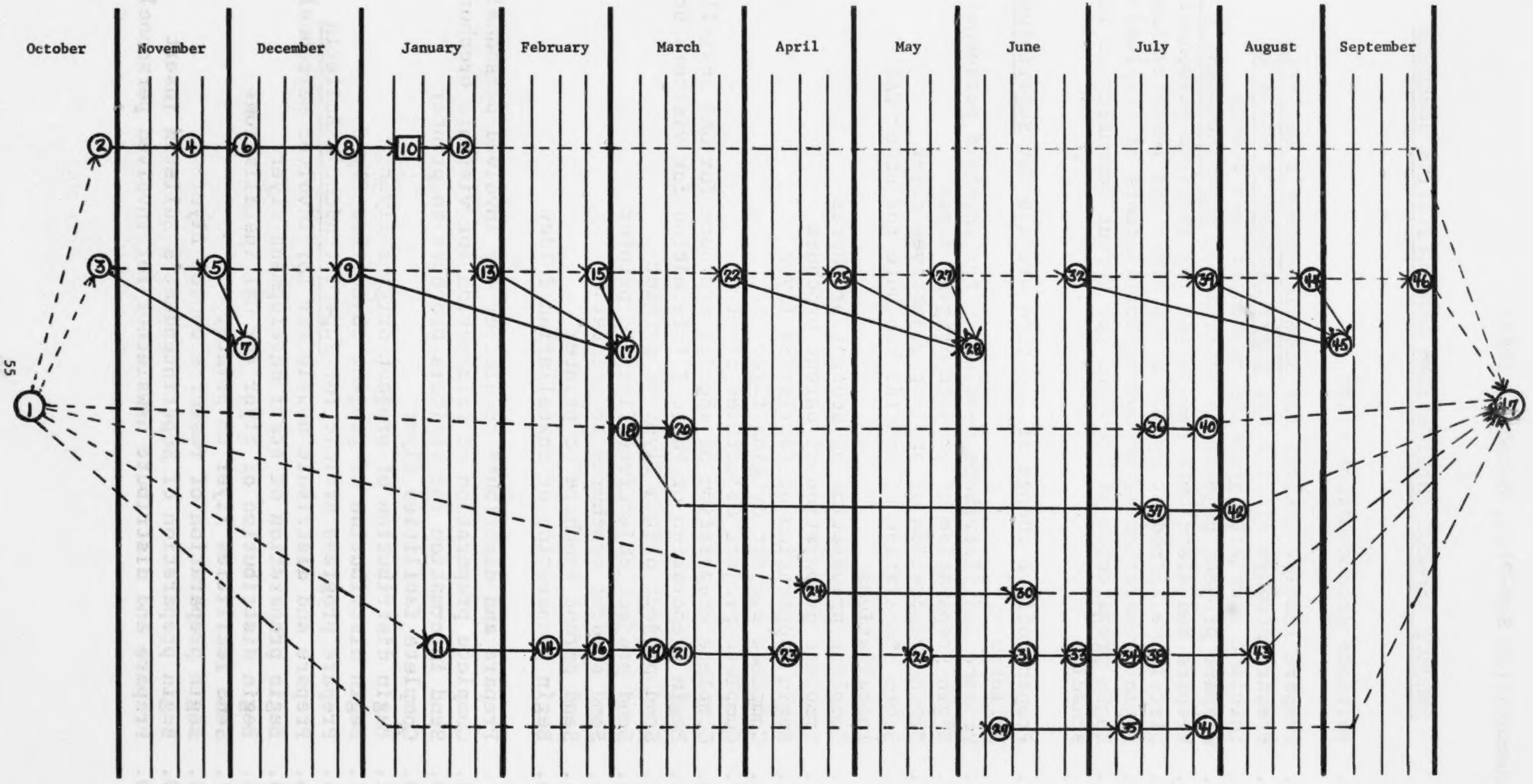
August 41. Send list of publications to Division of Publications
42. File MCPS budget request
43. Distribute second semi-annual report
44. Prepare monthly report for assistant superintendent for administration

September 45. Prepare report for Task Force Steering Committee
46. Prepare monthly report for assistant superintendent for administration

October 47. Initiate new documentation plans

(Excerpt, Documentation Sub-Plan, October, 1968)

PERT CHART OF REQUIRED PUBLICATIONS AND EVENTS


October
November
December
January
February
March
April
May
June
July
August
September
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47

Schedules for the annual report to the Board of Education and special reports will be added to this chart as dates of submission become available.

(Excerpt, Documentation Sub-Plan, October, 1968)

PROJECT REFLECT PUBLICATIONS AND ACTIVITIES SCHEDULE

October 1. Initiate documentation plans

November 2. Prepare initial article for *Superintendent's Bulletin*
3. Prepare acronym article for *Superintendent's Bulletin*
4. Initiate work with graphics on banner head design
5. Prepare project objectives article for *Superintendent's Bulletin*
6. Prepare and distribute newsletter for involved personnel
7. Distribute introductory letter to other CAI installations
8. Begin preparation of brochures for students of involved schools
9. Begin preparation of brochure for parent community of involved schools

December 10. Prepare office change of location article for *Superintendent's Bulletin*
11. Prepare and distribute newsletter for involved personnel
12. Begin preparation of project origins flyer
13. Begin preparation of project objectives flyer
14. Begin preparation of special brochure for other CAI installations
15. Complete preparation of student brochures
16. Complete preparation of parent brochure
17. Begin preparation of facilities flyer
18. Complete project origins flyer
19. Complete project objectives flyer
20. Complete preparation of special brochure for CAI installations
21. Begin preparation of Phase I information for visitors brochure
22. Send project origin flyer to printer
23. Send project objectives flyer to printer
24. Send student brochures to printer
25. Send parent brochure to printer
26. Begin preparation of installation folder

January 27. Prepare and distribute newsletter for involved personnel
28. Complete preparation of information for visitors brochure
29. Send information for visitors brochure to printer
30. Complete facilities flyer
31. Begin distribution of project origins flyer
32. Begin distribution of project objectives flyer
33. Prepare progress article for *Superintendent's Bulletin*
34. Prepare and distribute newsletter for involved personnel
35. Begin preparation of staff development flyer
36. Begin distribution of flyer for CAI installations
37. Send facilities flyer to printer
38. Begin preparation of resource center flyer
39. Begin preparation of Superintendent's Bulletin insert
40. Prepare and distribute newsletter for involved personnel

(Excerpt, Documentation Sub-Plan, October, 1968)

- 2 -

February
41. Distribute student brochure to Einstein students
42. Distribute brochure to Einstein parent community
43. Begin distribution of information for visitors brochure
44. Complete preparation of resource center flyer
45. Begin distribution of installation folder
46. Complete insert for *Superintendent's Bulletin*
47. Begin preparation of involvement brochure
48. Prepare and distribute newsletter for involved personnel
49. Conduct open house for involved personnel
50. Hold press conference at Einstein High School
51. Begin distribution of facilities flyer
52. Complete preparation of staff development flyer
53. Send resource center flyer to printer
54. Complete preparation of involvement brochure

March
55. Send involvement brochure to printer
56. Prepare and distribute newsletter for involved personnel
57. Begin preparation of slide-tape
58. Send staff development flyer to printer
59. Begin distribution of resource center flyer
60. Begin preparation of progress flyer
61. Prepare article for *Superintendent's Bulletin*
62. Prepare and distribute newsletter for involved personnel
63. Begin preparation of Staff Development Training Course Model
64. Begin distribution of involvement brochure
65. Complete preparation of slide-tape presentation for general audience and begin distribution
66. Begin distribution of staff development flyer
67. Complete preparation of progress flyer
68. Begin preparation of display for internal MCPS use
69. Send progress flyer to printer

April
70. Prepare and distribute newsletter to involved personnel
71. Distribute student brochure to Newport students
72. Distribute brochure to Newport parent community
73. Complete preparation of Staff Development Training Course Model
74. Complete preparation of display for internal MCPS use
75. Hold press conference at Newport Junior High School
76. Send Staff Development Training Course Model to printer
77. Prepare article for *Superintendent's Bulletin*
78. Prepare and distribute newsletter to involved personnel
79. Begin demonstrations for visitors from other CAI projects
80. Begin distribution of progress flyer
81. Begin to circulate display to schools

(Excerpt, Documentation Sub-Plan, October, 1968)

May

82. Prepare and distribute newsletter to involved personnel
83. Begin preparation of Phase II information for visitors brochure
84. Begin distribution of Staff Development Training Course Model
85. Prepare article for the Superintendent's Bulletin
86. Prepare and distribute newsletter to involved personnel
87. Prepare facility development model
88. Complete preparation of Phase II information for visitors brochure

June

89. Prepare and distribute newsletter for involved personnel
90. Distribute student brochure to Pleasant View students
91. Distribute brochure to Pleasant View parent community
92. Send Phase II information for visitors brochure to printer
93. Begin preparation of curriculum development flyer
94. Prepare article for Superintendent's Bulletin
95. Begin preparation of display for outside MCPS use
96. Complete preparation of facility development model
97. Prepare and distribute newsletter to involved personnel
98. Complete preparation of curriculum development flyer
99. Send facility development model to printer
100. Complete outside MCPS display
101. Send curriculum development flyer to printer
102. Hold press conference at Pleasant View Elementary School

July

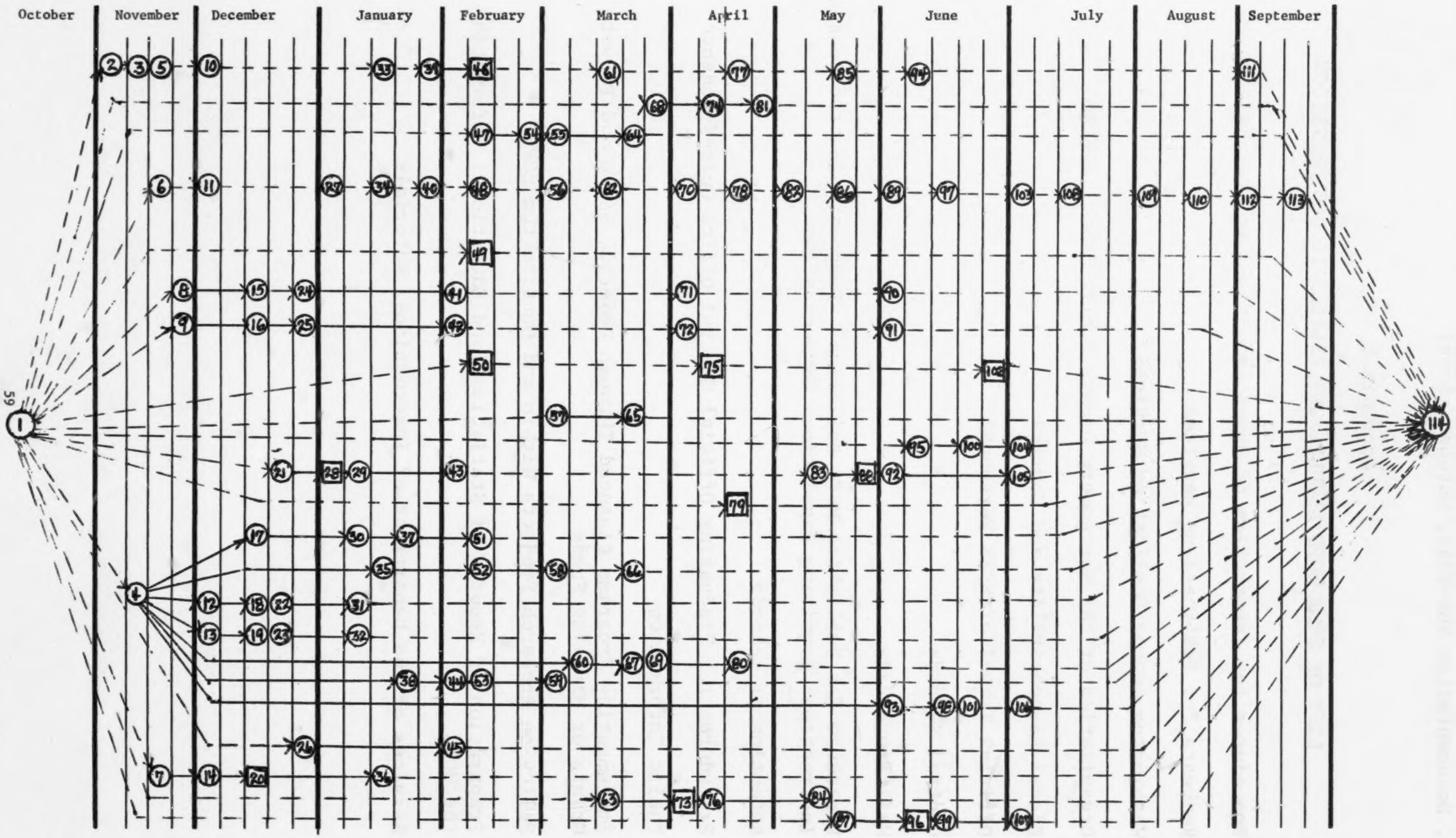
103. Prepare and distribute newsletter to involved personnel
104. Begin to circulate outside MCPS display
105. Begin distribution of Phase II information for visitors brochure
106. Begin distribution of curriculum development flyer
107. Begin distribution of facilities development model
108. Prepare and distribute newsletter to involved personnel

August

109. Prepare and distribute newsletter to involved personnel
110. Prepare and distribute newsletter to involved personnel
111. Prepare article for Superintendent's Bulletin
112. Prepare and distribute newsletter to involved personnel
113. Prepare and distribute newsletter to involved personnel
114. Initiate new documentation plans

(Excerpt, Documentation Sub-Plan, October, 1968)

PERT CHART OF PROJECT REFLECT PUBLICATIONS AND ACTIVITIES


October
November
December
January
February
March
April
May
June
July
August
September
1
2
3
5
10
33
39
46
61
77
85
94
111
68
74
81
47
54
55
64
6
11
27
34
40
48
56
62
70
78
82
86
89
97
103
108
109
110
112
113
49
8
15
24
41
71
90
9
16
25
42
72
91
50
75
102
57
65
95
100
104
21
28
29
43
83
88
92
105
79
17
30
37
51
35
52
58
66
4
12
18
22
31
13
19
23
32
60
67
69
80
38
44
53
59
93
96
101
106
26
45
7
14
20
36
63
73
76
84
87
86
99
107
114

(Excerpt, Documentation Sub-Plan, October, 1968)

Appendix B

LIST OF SOME MCPS REGULATIONS RELATED TO DOCUMENTATION

201-1	Procedures for Preparation of Board Agenda and Related Matters
202-1	Requests for Publications Services
202-3	Washington Center Duplicating Services
205-1	Organization of the Montgomery County Public School System
210-1	Fiscal Responsibility and Control
220-1	Official Travel of MCPS Personnel
225-3	Central Records
225-4	Mail Procedures
225-5	Procedure for Publishing MCPS Bulletins: Temporary Instructions or Instructions Requiring Expeditious Communication
225-6	Retention of Records
225-7	Procedures for Processing Official Central Office Correspondence
260-1	Public Information
301-4	Implementing Programs Financed Through Federal, State and Private Agency Grants or Matching Funds
340-1	Policy on Research Projects Within and Outside the MCPS
341-1	Preparation of Reports of Statistical and Educational Information for the MCPS
365-1	Services of the Department of Instructional Materials

(Excerpt, Documentation Sub-Plan, October, 1968)

Appendix C

SAMPLE OF MEMORANDUM REQUESTING APPROVAL OF ARTICLE

MEMORANDUM

To: Director, CAI Demonstration Project

From:

Subject: Communication Representing MCPS CAI Demonstration Project Policy or Practice

Title of Article:

Author:

Purpose:

Intended Audience:

Method of Distribution:

Other Departments or Divisions
To Which Article Is Being
Sent for Approval:

SUMMARY OF PLANNING

Resources, plans, activities, and events that must be addressed if the project is to attain its objectives were identified by the Master Plan draft completed in July, 1968. The Master Plan is designed to be a flexible, dynamic document, undergoing periodic changes and revisions as the project progresses. Implementation of the plan ordered the events necessary for accomplishment of the first major milestone, the operational installation of the computer system, which, due to planning, was completed prior to the February 1, 1969, target date.

Identifying and placing planned activities and necessary accomplishments, the Master Plan specified the major tasks to be performed in each of the three phases and established the design of sub-plans, each of which focuses attention on a vital system component of the project. Included in the document were an activity hierarchy and PERT network for each phase. Sub-plans described in the Master Plan are those for project management, curriculum development, research design, staff development, standard operating procedures, validation, evaluation, and documentation.

FACILITY AND EQUIPMENT

Contributors

John M. Boblick
Ronald P. Welker

OVERVIEW

Pleasant View Elementary School, Newport Junior High School, and Albert Einstein High School on adjacent properties in Kensington, Maryland, are the setting for the project. The computer, its peripheral equipment, and eight instructional terminals were put into use on February 1, 1969. Student stations at Pleasant View Elementary School are to be cable-connected to the computer in September, 1969. This section contains a delineation of the modifications at Einstein High School including the project offices, the computer room, and instructional area; components of the IBM 1500 Instructional System hardware employed in the project are also described.

FACILITIES

The project offices and computer room are located in a remodeled electronics classroom in Albert Einstein High School. (See Facilities chart next page.) Modification of this room, performed under the supervision of the MCPS Division of Construction, provided space for both the computer system and the staff offices. In addition, a room adjoining the instructional materials center has been rewired to accommodate the installation of student terminals. A third area at Einstein is used as a combination resource center, conference room, and staff development classroom.

Although the student terminal room and the resource center are air-conditioned by Einstein's central air-conditioning system, the wing of the building in which the project offices are located is not. It was necessary to install an air-conditioning system to provide the proper environment for efficient computer operation and to insure that project activities could continue throughout the summer months. Supervision of the air-conditioning installation was also conducted by the Montgomery County Public Schools Division of Construction.

Additional terminals will be located in the mathematics laboratory at Einstein, the physics laboratory at Einstein and a classroom at Pleasant View Elementary School for use in September, 1969. Cables connecting the computer with the terminals at Pleasant View will be purchased and installed.

EQUIPMENT

The IBM 1500 Instructional System employed in PROJECT REFLECT is composed of a central control complex, a station control, input-output devices, storage units, and instructional stations.

Central Control Complex

The IBM 1131 Central Processing Unit (CPU) contains the computer system's arithmetic and control elements. Core storage of 32,768 words is housed in the CPU; the unit also contains a magnetic disk cartridge on which can be stored 512,000 words. The core storage cycle time (the time to place a word in core storage or to retrieve it from core storage) is 3.6 microseconds (0.0000036 seconds).

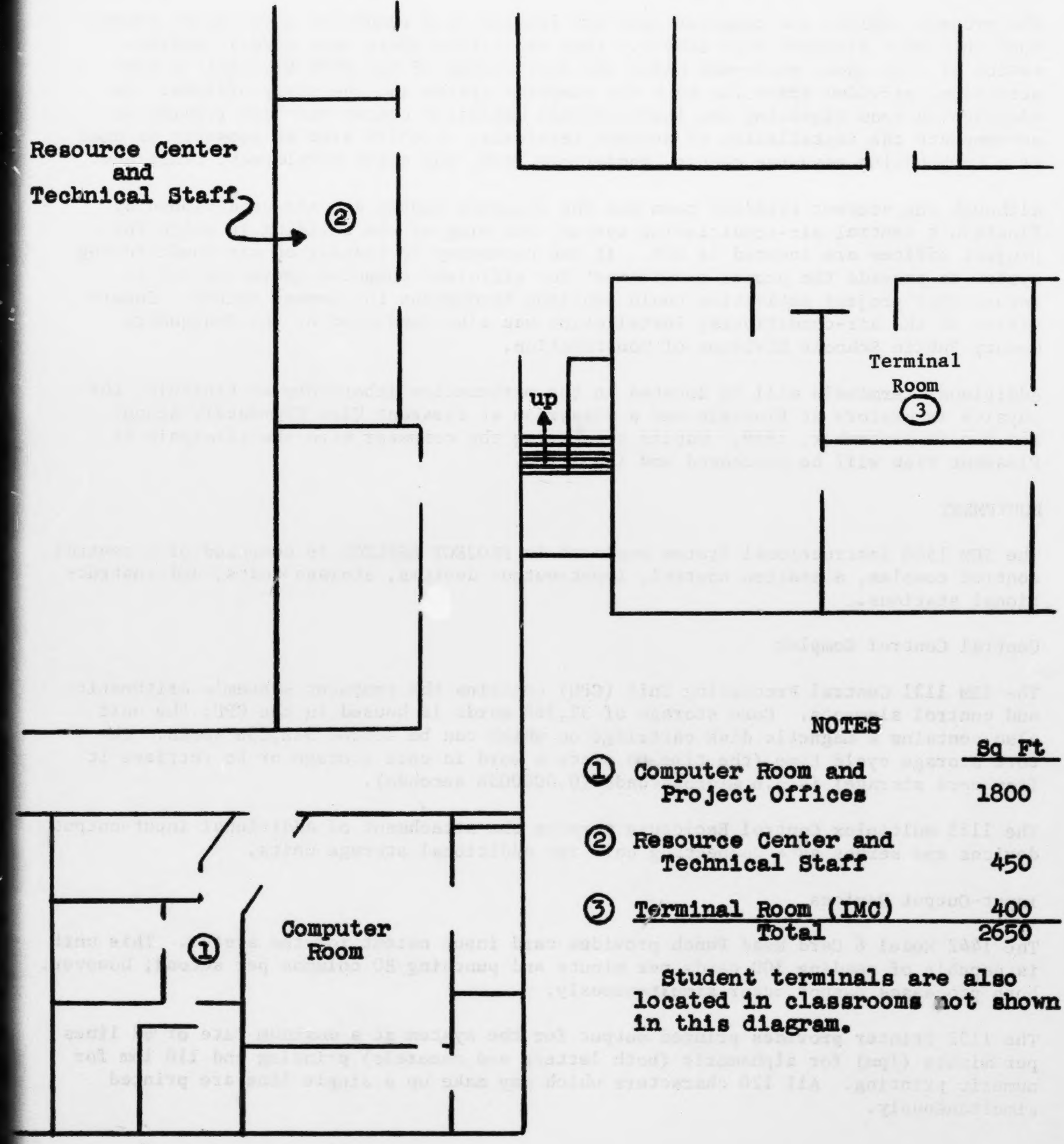
The 1133 Multiplex Control Enclosure permits the attachment of additional input-output devices and serves as a connecting unit for additional storage units.

Input-Output Devices

The 1442 Model 6 Card Read Punch provides card input output for the system. This unit is capable of reading 300 cards per minute and punching 80 columns per second; however, both processes cannot occur simultaneously.

The 1132 Printer provides printed output for the system at a maximum rate of 82 lines per minute (lpm) for alphameric (both letters and numerals) printing and 110 lpm for numeric printing. All 120 characters which may make up a single line are printed simultaneously.

CAI FACILITIES
Einstein High School
2nd Floor


Resource Center
and
Technical Staff
②
Terminal
Room
③
up
①
Computer
Room
Project Offices

NOTES

	Sq Ft
① Computer Room and Project Offices	1800
② Resource Center and Technical Staff	450
③ Terminal Room (IMC)	400
Total	2650

Student terminals are also located in classrooms not shown in this diagram.

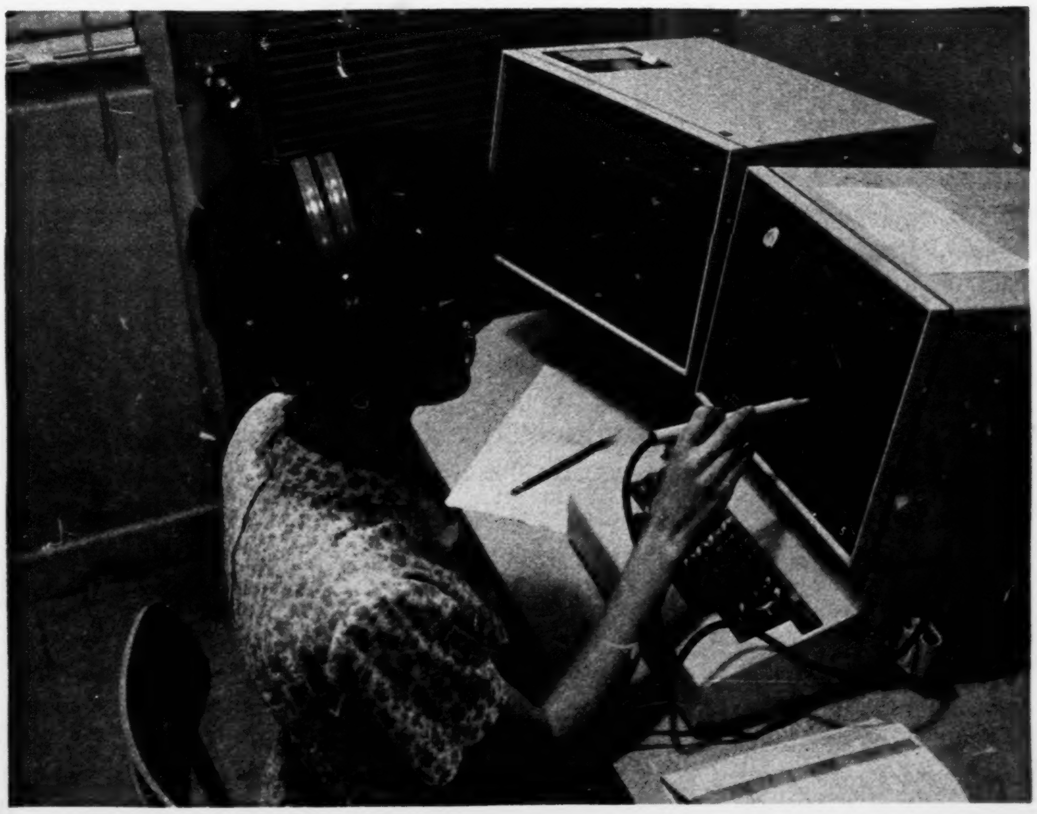
Storage Devices

In addition to the storage provided by the CPU, two 2310 Model B2 Disk Storage Units, containing two magnetic disk cartridges each, furnish randomly accessible storage space for 2,058,000 words. Although these disk cartridges are interchangeable and thus provide unlimited storage for course materials, only five disks (four in storage units and one in CPU) may be on-line at any given time.

The 2415 Magnetic Tape Unit will provide sequentially accessible storage space for student records, performance data, and other information which does not require random accessibility. The magnetic tape units are to be installed in July, 1969.

Station Control

The 1502 Station Control provides an interface between the central control complex and the instructional stations. Located here are the special features required to control instructional displays, light pens, and audio displays. This unit gives the system its time-sharing capabilities.



Instructional Stations

The 1500 system may utilize up to 32 instructional stations. Each station, or terminal, may consist of any combination of the following equipment:

The 1510 Instructional Display contains a cathode ray tube (CRT) which can display alphabetical and numerical characters, mathematical symbols, and other graphics. Student responses may be typed in using the keyboard or may be indicated on the CRT with a light pen. The light pen may be used when multiple choice questions are displayed; the student responds by pointing the light pen at the selected answer on the CRT screen.

The 1512 Image Projector has available 1000 images or frames on an interchangeable 16 mm film cartridge. The computer selects the appropriate frame for viewing by the student as directed by the program. These frames are randomly accessible.

The 1518 Typewriter may be used for both input and output. The student may type his responses on the typewriter and the system automatically types for the student a record of his dialogue with the computer.

The 1506 Audio Unit will be added to one terminal during Phase II. An interchangeable audio tape cartridge is controlled by the computer. In addition to the randomly accessible pre-recorded audio messages for the student, the tape cartridge provides space to record student input.

Current student terminal configuration is as follows:

Location*	CRT	Image Projector	Typewriter
Computer Room	0	0	1
Math Laboratory	0	0	1
Terminal Room	6	2	0

*All present terminals are located in Einstein High School

Student terminal configuration planned for September, 1969, includes terminals at Einstein and Pleasant View Elementary School.

Location	CRT	Image Projector	Typewriter	Audio
Albert Einstein				
Computer Room	0	0	1	0
Terminal Room	4	2	0	1
Math Laboratory	4	0	0	0
Physics Laboratory	0	0	1	0
Pleasant View Classroom	4	3**	0	3**

**Image projectors and audio units will be added to the Pleasant View terminal in January, 1970.

FACILITY PLANNING ACTIVITIES

This section provides a brief review of the major facility planning activities that were necessary for the establishment of the operational school setting of the project. The material is presented in outline form to facilitate the location of topics applicable to a given situation.

Outline of Facility Planning Activities

I. Site Selection Criteria

   A. IBM 1500 Instructional System

      1. A maximum of 32 terminals may be operated by the system.

      2. The maximum length for cables to terminal devices is 2000 feet.

   B. Space Requirements

      1. As it was important to locate the project staff in the involved schools, it was necessary for the schools to be able to provide space for the project offices and the computer system (approximately 1800 to 2000 square feet).

      2. Classroom space had to be available for student terminal placement.

   C. Innovative Atmosphere in the Schools

      The schools in which the project will function needed to exhibit an open-mindedness to innovative approaches to instruction.

II. Computer Room

   A. Computer Configuration

      1. Constraints

         a. Distances separating system components were determined by the maximum permissible lengths for interconnecting cables. Cable lengths are specified in IBM 1500 Installation Manual - Physical Planning (Form Y26-3695-1).

         b. Adequate service clearances around each unit were provided to insure servicing space for the IBM customer engineers. (See IBM Manual Y26-3695-1).

         c. Both 115 Vac, 60 Hz, single-phase, three-wire and 208/230 Vac, 60 Hz, three-phase, four-wire electrical power sources were required. The power distribution and grounding requirements are described in Y26-3695-1.

2. Efficient Operation

The computer system layout had to reflect a configuration which can be conveniently administered by the computer operator.

3. Demonstrations

An observation window was placed to enable visitors to view computer operations with a minimum of disruption to computer room activities.

4. Review

The computer room layout was submitted to IBM for review and recommendations.

B. Raised Floor

1. Safety

Interconnecting cables within the computer room produce a safety hazard unless placed beneath a raised floor.

2. Efficiency

The raised floor also provides an efficient method for channeling cold air to the individual computer components.

C. Air-conditioning

Air-conditioning in the computer room is described in Part IV.

III. Office Facilities

A. Staff Space Requirements

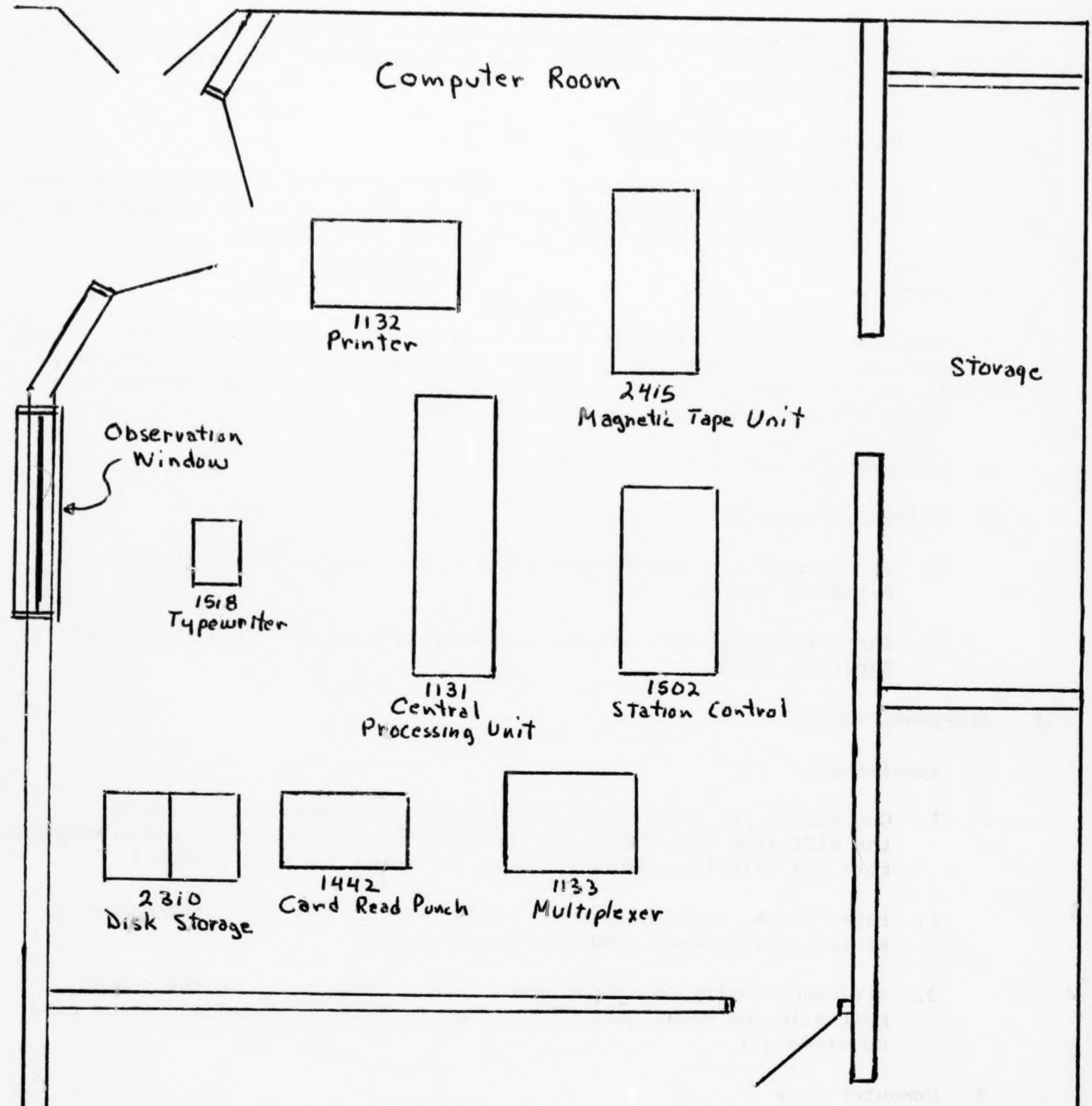
1. Professional and Administrative Staff

a. Office space was provided for the project director and the secretary to the director. These spaces were the only areas designated for occupation by one individual.

b. Three offices are shared by the six teacher specialists.

2. Technical Staff

a. A portion of the area originally planned for computer installation was made available for office use by the four programmers and the computer operator.


Computer Room
1132
Printer
2415
Magnetic Tape Unit
Storage
Observation
Window
1518
Typewriter
1131
Central
Processing Unit
1502
Station Control
2310
Disk Storage
1442
Card Read Punch
1133
Multiplexer
Technical Staff
Systems
Manager

b. A storage room adjoining the computer room was modified to serve as an office for the systems manager and senior programmer.

3. Customer Engineers

A service area was provided for use by IBM servicing personnel and for the storage of test equipment and spare parts; a second storage room adjoining the computer room was used for this purpose.

B. Furniture

Whenever possible, office furniture (desks, chairs, bookcases) was obtained from the Division of Supply Management, MCPS, surplus furniture inventory. However, purchases of desks, chairs and filing cabinets were necessary to supplement equipment obtained from supply.

C. Air-conditioning (See Part IV)

D. Telephone Services

1. An interoffice communications system was combined with outside telephone service.

2. Installation of this system was supervised by the Division of Office Services, MCPS.

IV. Air-conditioning

A. Requirements

1. Controlled air temperature and humidity are necessary to insure the efficient functioning of the IBM 1500 system. Permissible temperature and relative humidity ranges are specified in Y26-3695-1.

2. Paper stock, especially punch cards, used by the 1500 system must be stored under proper atmospheric conditions.

3. Air-conditioning of office areas is a necessity during the summer months in the Washington, D.C., area. (Some of the office areas have no windows.)

B. Computer Room

1. Installation was scheduled for late spring, 1969. Operation of the system was possible without air-conditioning until June, although it was necessary to shut down the system on a few occasions because of high temperatures.

2. A separate humidifier was installed in the computer room to insure proper humidity control.

3. Rewiring of the electrical system was required to support the air-conditioning operation.

4. Cold air is blown under the raised floor through vents in the floor near the computer components which need cooling.

C. Office Areas

1. All office areas are serviced by a separate air-conditioner, located in the storage room near the computer room.

2. A separate electrical circuit was needed for the air-conditioner.

V. Other Facilities

A. Resource Center

1. This room provides space for design team activities, staff development classes and workshops, and demonstrations.

2. No modifications of this room were required.

B. Terminal Room

1. Use of this room made the resources of the Instructional Materials Center readily available.

2. Rewiring of this room was necessary to provide sufficient electrical outlets for terminal operation.

C. Terminals in Classrooms

The IBM 1518 typewriter terminal was located in the mathematics laboratory during Phase I; no modifications to the classroom were necessary.

D. Cable Installation

1. Thirty different cables of ten different types with a total length of approximately 4100 feet were installed; these cables connected student terminals to the computer system.

2. The installation of these cables was performed by the Division of Maintenance, MCPS.

3. The entire installation was performed during nonschool hours and caused no disruption of classes.

VI. Planned for Phase II

A. Installation of Cables to Pleasant View Elementary

1. First Cable Installation of Its Type (IBM 1500 Instructional System)
    a. The schools are separated by a distance of approximately 1700 feet.
    b. Burial of this type of cable has not been tried before.
2. Cable installation has been planned by a consulting engineer and coordinated with the Division of Maintenance, MCPS.

B. Communication

Direct line telephone service between the computer room and the student terminal locations is necessary for efficient operation of the system.

C. Einstein Terminal Room

Surplus raised floor will be installed in the terminal room of Einstein High School to provide flexibility in the location of student terminals.

SUMMARY OF FACILITY AND EQUIPMENT

Central computer facilities are located in a modified classroom of Albert Einstein High School, Kensington, Maryland. Personnel offices, the computer room, conference space, and an instructional area have been acquired in the same building; the necessary structural and electrical modifications are one part of the MCPS support to the project.

Since operation of the computer system began February 1, 1969, eight terminals of the IBM 1500 Instructional System have been in use in the high school. Central processing unit (1131), station control (1502), printer (1132), multiplexer (1133), card read punch (1442), and two disk storage units (2310) have been in use during the computer operational stages of Phase I.

STAFF ORIENTATION, DEVELOPMENT AND RESPONSIBILITIES

Contributor

Kenneth A. Walter

OVERVIEW

Orientation and training programs for full-time staff members, a training course for classroom teachers who are part-time staff members, and orientation sessions to acquaint other Montgomery County Public Schools personnel with the CAI project, its goals and progress, were major tasks during this first year of the project. The formal staff training programs have been followed by informal in-service activities including visitations to other installations. Staff development is to be a continuing effort throughout the three years of the project. This chapter describes the staff development activities planned and implemented during Phase I.

TEACHER-SPECIALISTS

Six teacher-specialists are full-time staff members of the project. Adapting materials produced at other CAI installations and writing CAI modular instructional packages are functions of the teacher-specialists. Each teacher-specialist heads a curriculum design team in an area of teaching competence: elementary arithmetic and language arts, junior and senior high mathematics, senior high science (chemistry and physics), junior high science, French, or social studies. In this capacity, design team leaders (teacher-specialists) are expected to provide guidance and additional training, if necessary, to the three or four part-time supporting teachers on their team.

A training program for the teacher-specialists in curriculum and instructional materials was conducted by the project director. The initiation procedures were designed to supply the knowledge and skills necessary for writing modular instructional packages and for performing other specified functions within the project.

Orientation of teacher specialists to the project staff was characterized, for the most part, by an informal structure and an individualized approach. Each teacher-specialist was introduced to objectives in the areas of computer fundamentals, computer-assisted instruction, educational technology, programmed instruction, behavioral objectives, and individualized instruction by the project director. This enabled the teacher-specialist to define as goals those behaviors which he did not bring to the project or those he needed to reinforce. Activities directed toward specific job skills required of the individual teacher-specialists were included.

Using these objectives, the teacher-specialist outlined a program which utilized the resources available to aid him in achieving the desired behaviors. An extensive file of periodical articles and other project-related materials were furnished by the project director, the Curriculum Laboratory, and the Instructional Materials Center of the Department of Educational Media and Technology of Montgomery County Public Schools. The project director provided insight into the project's objectives and philosophy. He united the diverse aspects of the project into an understandable and meaningful aggregate through daily informal discussions of the topics the teacher-specialists were investigating.

Initial orientation required a shorter period than was planned because the personnel selected were more qualified than anticipated. For example, their entering behaviors included a working knowledge of behavioral objectives and experience in individualizing instruction.

As each teacher-specialist progressed through his individual program, a bibliography of those books and articles considered especially significant was compiled. Then each teacher-specialist assisted in the orientation of a new staff member by providing guidance and direction to enable the newer member to achieve his orientation goals.

Visiting the Academic Computer Center of the U. S. Naval Academy, Annapolis, Maryland, in August, 1968, acquainted the teacher-specialists with the operations of the IBM 1500 Instructional System. The similarities of this system and the one used in the MCPS CAI Demonstration Project enabled the teacher-specialists to formulate and modify their concepts of an operating CAI system.

IBM systems engineers conducted a special two-week course in Coursewriter II for the group during September, 1968. This introduction to the language gave the teacher-specialists some of the background needed to prepare curriculum materials for use on the CAI system using this language.

Familiarity with A Programming Language (APL), another language in use with the system, was initiated with the temporary installation of a teletype terminal. The use of this remote terminal in October, 1968, was preceded by the viewing of videotape recordings which described the basic concepts and use of APL. Orientation to this computer language continued with the project staff visit to the Computer-Related Instructional Systems branch of Science Research Associates, Inc., in Chicago. This visit in November, 1968, enabled the teacher-specialists to continue their study and use of APL, and to review materials in science and mathematics produced by SRA, a subsidiary of IBM.

When the teacher-specialists in staff development and pupil and program appraisal joined the project in February, 1969, the objectives of the teacher-specialist orientation program were well-defined and the computer system had been installed. Consequently, these two staff members were oriented with comparative ease and with a minimum amount of guidance from the other members of the project staff.

Visits to other CAI installations, Individually Prescribed Instruction projects, and other Title III locations have supplemented the knowledge of the project staff. Attendance at conventions and conferences has also added to the staff resources not only through knowledge gained but also through contacts gained.

TECHNICAL STAFF

With the help of a senior programmer and a computer operator, the systems manager furnishes the project with the technical knowledge necessary to operate the IBM 1500 Instructional System. Employing four instructional programmers has reduced the necessary professional staff training period in computer languages. The teacher-specialists and supporting teachers are able to devote their time to curriculum development rather than to coding material which the programmers do with a resultant saving of time and money. Members of the technical staff, with the exception of one person, have had some previous computer experience and/or preparation. Since joining the project all have been exposed to additional training.

Systems manager, Ronald P. Welker, who joined the project in January, 1969, has an extensive computer background including two years previous experience with the IBM 1500 Instructional System. He has attended IBM seminars on image projector and audio cartridge preparation. Both the systems manager and the senior programmer, James R. Eshleman, attended the Spring Joint Computer Conference. The senior programmer came to the project with one year of experience working with the IBM 1500 Instructional System.

Computer operator Douglas Parker has one year of previous experience in data processing. He is receiving on-the-job training under the leadership of the systems manager and senior programmer.

Since none of the instructional programmers had a background in the Coursewriter II and APL computer languages employed in this project, the systems manager designed and conducted a four-week training course in Coursewriter II; and Teacher Specialist in Curriculum Catherine Morgan conducted an informal training course in APL. The Coursewriter II course began with a pretest being administered to establish the entering behaviors of the four programmers. Using Coursewriter II Author Guides and a list of behavioral objectives to direct their study, the programmers at the end of two weeks of on-line drill and practice were competent in the language and ready for the post-test. The programmers have also participated in a FORTRAN IV workshop.

SUPPORTING TEACHERS

Twenty-three teachers are involved on a part-time basis in the development of curriculum packages. Teams consisting of a full-time teacher-specialist and three or four teachers who devote 10 per cent of their time to the project have been formed in senior high science, junior high science, secondary mathematics, elementary school subjects, French, and secondary social studies. The part-time staff members for each team were selected by the teacher-specialist acting as leader; conferences with the project director were held prior to the selections. Part-time staff members who serve on the design teams are called supporting teachers.

Nine supporting teachers, distributed among the elementary school subjects, junior high science, senior high science, and secondary mathematics design teams, participated in the first training course. One day every other week from October, 1968, to March, 1969, the supporting teachers participated in a training course prepared by the full-time staff. The course was prepared with two objectives in mind: the orientation and training of teachers for effective participation in design teams charged with the responsibility for preparing curriculum packages for computer-assisted instruction and the preparation of a model for a training course for teachers who will be preparing CAI materials.

In order to assist in the production of instructional packets, the supporting teacher needed training so as to be able to

1. Choose an instructional segment to be developed
2. Write specific objectives for the instructional segment
3. Sequence objectives into a hierarchy
4. Specify entering behaviors for the instructional segment
5. Write criterion test items for the specific objectives
6. Write pretest and post-test for the specific objectives
7. Specify method of presentation of unit:
    a. CAI techniques to be used

b. Audio-visual aids
c. Other instructional materials to support unit
d. Develop instructional segment for CAI
e. Prepare instructional segment for CAI
f. Debug instructional segment
g. Test materials with small group of students
h. Revise, where necessary, and document

In the development of the course, the staff agreed on a procedure which closely paralleled its philosophy of curriculum development. For each course segment, behavioral objective criterion test items were prepared. The course was divided into three main parts, the second (II) of which was completely individualized. Individualization of instruction is a basic component of the project philosophy.

The main parts of the course were (I) Computers and Computer-Assisted Instruction; (II) Individualized Instruction, Behavioral Objectives and Criterion Tests, Flowcharting and Programmed Instruction; and (III) Computer Languages - Coursewriter II and APL (A Programming Language).

Since the production of a training course is an integral part of the project objectives, a course validation pretest and post-test and an attitude inventory were prepared by the staff. The pretest, attitude inventory, and post-test were administered with instructions for the teachers to code their answer sheets; the purpose of these items was to evaluate the course rather than to score individuals. A comparison of the scores on the pretest and post-test will determine the effectiveness of the program.

Computers and Computer-Assisted Instruction were the subjects of the first three training sessions conducted by the project director. A post-test on the units followed. Films, slides, lectures, and discussions were used in the instruction; a visit to the IBM Advanced System Development Division in Washington, D. C., was arranged so teachers could view equipment similar to the 1500 Instructional System.

A pretest for Part II--the section of the course relating to individualized instruction, behavioral objectives, criterion tests, flowcharting, and programmed instruction--was given, corrected, and returned. The sessions that followed were devoted to Part II, the individualized section of the course. Books, articles, and audio-visual materials were made available so that each person could progress at his own rate and according to his own needs. Opportunities for discussion with staff members were available during all sessions.

Following the completion of Part II, group instruction was given in the computer languages used in the project. This instruction was limited to concepts of major importance as teachers will not be doing their own programming, but they do need to know the capabilities and limitations of the languages.

Consultant assistance was used in the preparation of the programmed instruction section of the individualized part of the course. All other materials for the course were prepared or collected by project staff members. The assistance of other MCPS staff members, especially those in the Department of Educational Media and Technology, was extremely helpful in assembling materials to be used.

From April to June, 1969, eleven teachers participated in a second group receiving the training course. The members of this course were three teachers from the foreign language area, six additional teachers from mathematics and science, a teacher from a Montgomery County parochial school, and a teacher from a Montgomery County private school. Essentially the same 80-hour course as the previous one was offered; some minor revisions were made. The availability of the operating computer made possible some desirable changes in the computer language section of the course.

Based on the suggestions of the teachers in the two previous training programs, on their performance with the design teams, and on the observations of staff members, several revisions were made in the course before it was offered to a third group of five supporting teachers. The objectives for the section on computer fundamentals were rewritten, reducing the time spent on this topic from three sessions to one session. During the individualized study section, more direction and instruction were provided by the project staff with the emphasis on practical applications. In order to acquaint the teachers with the operation of the student terminals and with CAI techniques, the pretest and post-test were put into the computer.

This third group of five supporting teachers (three social studies, one junior high science, and one high school French) participated in five one-day training sessions from April to June, 1969. As with the two previous courses, data including objectives, teaching materials, bibliographies, test scores, teacher reactions, and staff observations has been collected for validation and documentation purposes.

PARTICIPATING SCHOOLS

Those three schools, Albert Einstein High School, Newport Junior High School, and Pleasant View Elementary School, which are involved in the project, are referred to as the participating schools. Since the success of the project to a large degree will depend on the attitudes and skills of the personnel in these schools, considerable emphasis has been and will be placed on orientation and training of these persons.

Each school staff was initially introduced to Computer-Assisted Instruction and the CAI Demonstration Project in August, 1968, through a 35-mm slide presentation, followed by a discussion period for exchaning ideas and answering questions. In the weeks between the first presentation and the movement of the project offices to Albert Einstein High School, teacher-specialists visited all three participating schools and talked informally with administrators and teachers, answering questions and presenting ideas. After the computer was installed at the end of January, 1969, the faculties of the three schools were invited, along with other MCPS officials, to an open house at the Einstein High School facilities.

Beginning in April, 1969, approximately 75 teachers from the three participating schools, meeting in small departmental or grade level groups, have been exposed to a two-hour orientation which included on-line time at the computer terminals and an opportunity to discuss the implications and applications of CAI in the public school. The teachers were asked to suggest areas of curriculum development which would be beneficial to them as classroom teachers and were invited to become actively involved in the production of modular instructional packages, if they wished. These orientations will be resumed in the fall and continued until all the professional staff members of the three schools have been exposed.

During spring, 1969, Catherine Morgan, teacher-specialist in curriculum, taught the APL computing language to the entire mathematics department at Albert Einstein High School. These five consecutive sessions conducted during the teachers' one-hour planning unit were designed to enable the mathematics teachers to make effective use of the typewriter terminal located in the mathematics laboratory.

CAI PARTICIPATING SCHOOLS COMMITTEE

Principals of the three schools, the area director, and the project director compose the CAI Participating Schools Committee. Meeting regularly, this committee coordinates the activities of the project within the three schools. These administrators will play a major role in the project by providing leadership and support to their faculties, by explaining the project goals to parents and other members of the school community, and by conducting orientation programs and demonstrations for small groups of educators from MCPS and elsewhere. In order to provide these various functions, in addition to the information provided by the project director at each of the committee meetings held, a three-day orientation is planned for the second week of July, 1969.

ORIENTATIONS

Small group meetings, featuring a short presentation with slides followed by a group discussion of project goals and relations to existing MCPS programs, have been held since August, 1968.

In individual meetings held for the mathematics, science, social studies, and foreign language divisions of the Department of Supervision and Curriculum Development and for the Department of Educational Media and Technology, central office personnel, general supervisors and teacher-specialists, have been initially exposed to the project. From time to time project staff members have consulted and discussed various aspects of the CAI Demonstration Project with individual supervisory personnel at the administrative center (referred to as central office) for the school system, located in Rockville, Maryland.

After the facilities were remodeled and the computer installed, an executive open house was held for central office personnel directly involved with the project. The sessions at Einstein High School on February 26, 1969, featured presentations, demonstrations, and discussions conducted by the entire project staff. Purpose of this open house was to give an overview of the CAI Demonstration Project. The superintendent of schools, Dr. Homer O. Elseroad, was unable to attend the open house but visited the project on March 10, 1969.

Quarterly reports to the Steering Task Force Committee regarding the progress of the CAI Demonstration Project are given by the project director and other members of the project staff, when appropriate. (The Steering Task Force and its purpose are described in the planning chapter).

Since the computer was installed at the end of January, 1969, a number of two-hour orientation programs have been presented. Among the participants from the MCPS were the school administrators from administrative Area 6 (the area of the project schools), the resource personnel from the Department of Educational and Managerial Information and Analysis summer workshop, the industrial arts resource teachers, and the secondary school mathematics resource teachers.

DISSEMINATION

In an effort to inform all Montgomery County Public Schools personnel about the CAI Demonstration Project, four articles appeared in The Superintendent's Bulletin. Through this system publication, the project staff has attempted to convey a description of the origin, organization, goals, and progress of the project.

Periodic publication of the Project REFLECT Newsletter has provided additional information for those persons who are directly or indirectly associated with the project or who have expressed a special interest in the project.

SUMMARY OF STAFF ORIENTATION, DEVELOPMENT AND RESPONSIBILITIES

Since Computer-Assisted Instruction is one of the most recent developments in the field of educational technology, few educators understand the implication and the potential of this new medium; and those who have a working knowledge of a CAI system are rare. Obviously, a major concern of this project must be staff orientation and development if the project is to accomplish its goals.

The project centers around six curriculum design teams which develop and adapt materials for computer use. Each design team is composed of three to four supporting teachers available to the project 10 per cent of their time and of a full-time teacher-specialist who, in addition to providing leadership to the design team, performs other special functions within the project.

Initial orientation for the two teacher-specialists in curriculum and the one in instructional materials was conducted by the project director during August and September, 1968. This individualized orientation included educational technology, individualized instruction, computer-assisted instruction, behavioral objectives, programmed instruction, and computer languages. Information was acquired through reading, formal instruction, informal discussions, and visits to other CAI installations. As the first three teacher-specialists completed their orientation, they designed the supporting teacher training program and assisted with the orientation of three additional teacher-specialists.

Since October, 1968, twenty-three Montgomery County Public School classroom teachers have been exposed to training in the skills and techniques deemed necessary for writing and adapting CAI materials. Through tests, staff observations, and teacher comments, data has been gathered to aid in revising the training program and in developing a validated model teacher training program.

Six full-time employees working under the supervision of the systems manager provide the technical skill in computer operation and programming necessary for the project. Although most of the technical staff members had some background relating to computers, all have supplemented that knowledge by formal and informal training.

Beginning in August, 1968, groups of teachers in the three participating schools and a variety of administrators, supervisors, teachers-specialists, resource teachers, and other Montgomery County Public School personnel have had an opportunity to visit the project facilities and/or to participate in discussions with members of the project staff. An effort has been made to reach all MCPS personnel by disseminating information through The Superintendent's Bulletin.

Two committees have been established to coordinate and to direct the project activities within the Montgomery County Public Schools. The Participating Schools Committee meets regularly with the project director to exchange information and to plan the CAI program and its implementation within the three schools. At the county administrative level, the Steering Task Force receives progress reports on the project and provides general guidance.

MODULAR INSTRUCTIONAL PACKAGES PRODUCTION

Contributors

Catherine E. Morgan
William M. Richardson
Beverly J. Sangston
B. Jean Wastler

OVERVIEW

The development of extensive amounts of curricular materials was NOT one of the major original project goals; however, as available materials were reviewed and evaluated and the lack of available, suitable materials was evidenced, attention moved from the production of a limited number of modular instructional packages to the production of a greater number of materials. The Curriculum Development Sub-Plan established procedures to be followed in development of the instructional materials. As experience is gained in development and use of CAI materials, the project staff will revise the Curriculum Development Sub-Plan. This chapter describes the philosophy of development, the steps in producing modular instructional packages, CAI techniques used and materials produced, and the role of full-time and part-time staff members in materials development.

PHILOSOPHY OF DEVELOPMENT

Inherent in the project's objectives is the requirement of providing instructional materials for validation and evaluation. This requirement is being met either by utilizing materials written for other installations or, if these are unavailable or unsuitable, by developing modular packages.

Experience to date has shown that CAI materials prepared for other institutions have been extremely limited. Most CAI installations are housed at universities; as a consequence, the available materials have been less suitable for elementary and secondary school utilization, needing extensive revision and recoding before such use. However, the Kansas City Title III project has produced a number of CAI packages for use in their public schools; review of these materials indicates some of them may be useful in the MCPS undertaking.

Selection of modules acquired by either method is made with certain criteria in mind. The modules must be identifiable with MCPS goals and must dovetail with present or projected curricula. It is essential that the materials employed are, or have been, developed with behavioral objectives clearly documented and criterion test items for each objective. Underlying all selections is a commitment to the principle of individualization of instruction. Teacher-specialists with their design teams have identified for development a variety of concepts and skills.

Modular instructional packages are basically of a single concept type; no attempt is being made to develop entire units or courses or to fill specific time allocations.

COMPUTER-ASSISTED INSTRUCTION AND CAI TECHNIQUES

Computer-Assisted Instruction, as defined in this project, is the utilization of remote time-shared computer terminals to assist the teacher in assuring student attainment of specific learning objectives through the individualization of the instructional process. The basic CAI instructional techniques fall into the following categories: (1) Tutorial Dialogue, (2) Drill and Practice, (3) Simulation, (4) Problem Solving, (5) Testing, and (6) Others.

CAI strategies seldom consist of a single CAI technique, but, rather, contain various combinations of these techniques.

Tutorial Dialogue

One of the most widely developed CAI techniques is the tutorial dialogue between a student and the computer. This technique is characterized by (1) the presentation to the student of learning material in various step sizes; (2) a question or test item; and (3) evaluation of the student's response, reinforcement, and/or branching to another section of the instructional program.

Essentially, there are two basic formats in which the tutorial technique is presently being used in CAI lesson design. The first consists of a "complete" tutorial dialogue between the student and the computer. This is to imply that all information, concepts, and learning materials are presented to students via the CAI terminal and that no "off-line" methods are used. Except in the lower elementary grades, this amounts to a tremendous quantity of material flowing through the computer; and, if exaggerated, the computer has a tendency to develop into an expensive page-turner. The second form of tutorial lesson is referred to as a "partial" tutorial dialogue where the student's initial exposure to the material to be learned is from an "off-line" source such as a traditional lecture, ETV, or reading material. The material may initially be presented to the student in a more rapid, condensed form which is limited to one-way communication, material to student. The student would next be exposed to diagnostic testing routines via CAI which would test his attainment of each concept presented via the initial source and branch him to two-way tutorial routines, as previously described.

Drill and Practice

Utilization of remote terminals for what otherwise might be long and tedious drill and practice exercises of concepts to which students have been previously exposed is a second basic CAI technique. To date, this technique has been most usefully exploited at the elementary school levels via remote teletype or typewriter terminals. The instructional strategies are usually quite simple; the computer is used to provide practice in particular concepts and diagnosis of the child's weaknesses. At the end of each day, the computer data can indicate to the teacher which pupils need help, their specific areas of difficulty, and the class standing of each student.

There are basically two types of drill and practice exercises. The first consists of practice problems and routines that are designed by the course author, generated by the instructional program, and presented to the student via the computer terminal. The second type of drill and practice is substantially different as the student is allowed to generate his own problem set. Such an exercise provides the student with the opportunity to construct his own problem set, input data, and respond with his solution to the practice problem. The computer calculates the correct answer and compares it to the student's response. The instructional program may branch the student to particular additional problems or suggest the student construct a particular kind of problem or one of more difficulty.

Simulation and Gaming

Computer simulation of laboratory exercises and other real world situations represent a third significant CAI technique. In this technique a mathematical model is generated which simulates the real life occurrence of a particular environment and allows the student to interact with the model. This technique can provide learning experiences to students that might not otherwise be available due to factors such as safety, equipment, cost or availability, prohibitive set-up time, or other factors of cost or convenience.

Simulation of science laboratory exercises can take several forms. There are a number of experiments which would be desirable to perform in secondary school, but sufficient equipment or time is not available. These experiments may be simulated by the construction of mathematical models for exposure to all students or used as enrichment for more advanced students. A second utilization of simulated laboratory experiment has been performed. Still another use of a simulation is a group classroom demonstration which is integrated into the traditional instructional setting.

Problem-Solving

Utilization of remote computer terminals to perform calculations of various complex formulas or expressions reduces the time students devote to routine calculations. The power of the computer known as problem solving is brought into the classroom in an effort to introduce more complex learning materials.

Remote terminals can be utilized for problem solving in two fundamental modes. The instructor in a traditional classroom or laboratory situation can use the terminal to "demonstrate" the result of changing various parameters of a complex situation. In such a situation only the instructor, or a small number of students, actually interacts with the terminal; but the results are used to support concepts presented in class. The second mode of the problem-solving technique is the use by the individual student of the calculational power of the computer on a real-time basis in conjunction with CAI materials. For example, if at a particular point in the design of a CAI lesson it would be advantageous to have the student solve a complex mathematical expression, he can do so without leaving the instructional setting. The student may either enter a calculational mode or a program definition mode.

Testing

Testing can be applied either as a stand-alone application or, as most often occurs, in combination with one of the other four basic techniques. CAI materials should exploit to the utmost the computer's ability to present criterion tests, collect student responses, and analyze large volumes of data. There are numerous methods of applying the testing technique to CAI instructional strategies. A few of these are measures of student attainment of specific objectives, diagnostic testing for remedial sequences, curriculum validation criteria, and administrative testing.

Other Techniques

Additional techniques are being developed and explored for their assistance in student attainment of specific objectives. These techniques include guided discovery, which may be identified to be a specialized type of tutorial dialogue, and computer organized references, resources and learnings, a type of computer-managed instruction. Employing the capabilities of the computer for storage and retrieval may result in identification of an instructional technique for periodic recording, retrieving, and analyzing of data.

DESIGN TEAMS

During Phase I of the project, six full-time teacher specialists joined the professional staff. After completing an informal orientation and training program the teacher specialists assumed the general responsibilities of providing leadership for a design team in a designated curriculum area, reviewing and evaluating CAI materials for adaptation within the project, and initiating and developing instructional modules for student use in the Montgomery County Public Schools. The project objectives specify four areas of primary emphasis in curriculum development: senior high school science, junior high school science, secondary school mathematics, and elementary school subjects.

Senior High School Science

Efforts of the senior high school science design teams, under the leadership of Teacher Specialist in Curriculum John Boblick, have been concentrated in the areas of chemistry and physics. The team has the responsibility for the evaluation of existing CAI materials, the adaption of existing CAI materials for use within the framework of the Montgomery County chemistry and physics curricula, and the development of new CAI materials where no suitable materials exist.

Many of the existing CAI materials have been found, by the design team, to require major revisions in objectives and programming before being implemented in the Montgomery County Public Schools; therefore, materials for use in the MCPS CAI project are being developed.

In the selection of topics for the modular instructional packages to be produced, the design team has attempted to identify those areas in the high school programs which lend themselves to implementation by CAI.

Several modular instructional packages (MIP's) have been produced during Phase I and are available for student use:

1. A drill and practice in using an oxidation potential table to predict whether a spontaneous chemical reaction will occur if two substances which are found on the table are placed together
2. A simulation of an acid-base titration which permits students to apply the chemical principles associated with a titration without requiring a great expenditure of time and effort working with caustic acids and bases in the laboratory.
3. A simulation of the elastic collision of two bodies which enables the student to "discover" the conservation of momentum
4. A simulation of the motion of a body in the Earth's gravitational field which produces graphic representation of that motion
5. A simulation of Coulomb's Law which describes the relationship between the separation of charged particles and the elastic force between them
6. A tutorial dialogue relating the behavior of a lens to the refraction of light
7. A chemical reference table providing an on-line source of chemical data
8. A diagnostic test to determine if a student is able to write a chemical formula when given the name of the compound, and given the chemical formula is able to name the compound

The following topics have been identified for mocular instructional package development during Phase II:

Chemistry	The Uncertainty of Laboratory Measurement
	Vapor Pressure
	Balancing Chemical Equations
	Calculations Based on Atomic Weights and Formula Weights
	Calculations Based on Balanced Chemical Equations
	Atomic Structure
	Pressure Measurement
	The Gas Laws (Boyle's, Charles' and General)
	Energy Changes in Chemical Reactions
	Why We Believe in Atoms
	The Hydrogen Spectrum
	Metric Measurement
Physics	IR Drops Within A DC Circuit
	Vector Addition and Subtraction
	Scalar Products of Vectors
	Components of Vectors
	Charging by Conduction and Induction
	Analysis of Laboratory Data
	Use of Graphical Analysis to Determine the Relationships Among Distance Traveled, Velocity, and Acceleration
	A Two-Dimensional Collision
	Transmission and Reflection of Waves
	Parabolic Mirrors
	Images Formed by a Converging Lens
	Frames of Reference
	Periodic Waves

Junior High School Science

Topics to be developed and/or adapted within some segments of 7th grade science, 8th grade science or Earth Science Curriculum Project science, and 9th grade science have been identified by the junior high science design team under the leadership of Teacher Specialist in Instructional Materials Jean Wastler.

Completed and available for student use are these packages:

1. A tutorial dialogue providing instruction and practice in the development and reading of a general key with adaptations to various fields of science such as taxonomy, geology

2. A guided discovery in the identification of rock specimens according to observable physical characteristics

3. A tutorial program providing instruction and practice with the Vernier caliper, including measuring to the nearest hundredth of a centimeter and identification of the least count of the caliper

In addition to these instructional segments, two initial packages, "Entry" and "Getting to Know the Computer," have been developed to introduce the students to the terminal and acquaint them with the response methods as well as with the capabilities and limitations of the computer.

Specific areas for development have been identified by science teachers at Newport Junior High School and by members of the junior high school science design team. Objectives which these teachers think can be more effectively accomplished through Computer-Assisted Instruction were identified using these considerations:

1. Students may bring a diversity of background to a topic area.
2. Safety or limitations in facilities, equipment, or time may narrow the scope of a course.
3. Responses of other students sometimes cloud or block a student's thoughts.
4. Rates of learning vary.
5. Students are motivated by different techniques and materials.
6. Students learn according to their educational personalities.
7. Students are not all ready to achieve an objective at the same time. (They may have accomplished some previous objective and be ready to move to another while other students need considerably more time and assistance with the previous objective.)
8. Objectives should not be the same for all students.

Student identification of areas for potential development has been underway and will be reflected in some of the selections for Phase II efforts.

Planned for developmental use during the 1969-70 school year:

7th grade science	Dominant and Recessive Traits Cancer and Smoking Observation and Field Study Parasites Bacteria Introduction to Pressure (Structure of Matter and Solutions developed for use at other grade levels or at other installations will be adapted for 7th grade use.)
8th grade science	Mechanical Advantage Rock Cycle Rock Identification with Specimens Mass, Volume, and Density (How to Read a Key will have adaptations for geological use at this grade level. Ratio and Proportion, Solutions and Measuring Liquids will also have some adaptations for use at this level.)

Earth Science Curriculum Project (taught in some 8th grade classes)	(Units listed under 8th grade science with the exception of Mechanical Advantage will be used.) Weather Watch Acceleration (Density and Pendulum developed for use in another grade level will be adapted for use in ESCP.)
9th grade science	Measuring Liquids Using the Vernier Caliper Pendulum Solutions Ratio and Proportion Oxidation, Reduction Building and Naming Organic Models Microscopic Measurement How to Read a Key - Taxonomical (Relative Error, Introduction to Pressure and Pressure Continued, developed at another CAI installation, are being adapted for use. Mass, Volume and Density, Acceleration, Observation and Field Study, and Structure of Matter are adaptations of junior high science programs developed for use at 7th or 8th grade levels.)

Orientation to the terminal for all junior high science students will be through the use of the "entry" program on how to operate the terminal. The second CAI experience for 7th, 8th, and 9th grade students will be "Getting to Know the Computer," the modular instructional package on capabilities and limitations of the computer system. "Getting to Know You," a learning style packet in which the student has an opportunity to make some decisions regarding techniques of presentation of material, will be used with some students.

Mathematics

Under the leadership of Teacher-Specialist in Curriculum Catherine Morgan, the mathematics design team has developed and adapted instructional packages for junior and senior high school mathematics.

The following segments have been developed in Phase I and are ready for student use:

1. Ratio and Proportion
2. Introduction to Vectors
3. Dimensional Analysis
4. Slope of a Line
5. Perimeters and Areas of Plane Figures
6. Surface Areas and Volumes of Three-Dimensional Figures

These areas for development have been defined:

1. Numerical Relationships Through Analysis of Data and Graphs
2. Problem Solving

3. Logic
4. Similarity
5. Radicals
    - Notation
    - Operations
    - Simplification
    - Equations
6. Remedial Packages in
    - Computation
    - Whole Numbers
    - Fractions
    - Decimals
    - Per cents
7. Permutations and Computations

The teacher-specialist has also familiarized the mathematics teachers at Einstein High School with APL (A Programming Language) so that they may instruct their students in the use of the terminals for remote computing and defining functions. A course at Einstein High School in summer, 1969, will present instruction in those mathematical skills necessary for success in chemistry and physics courses. The computer will be used for remote computing and for instructional purposes in the course.

Chemistry and physics students at Walter Johnson High School and Einstein High School filled in questionnaires regarding skills necessary to succeed in the courses. Based on the results of this survey, the objectives of the Math Skills for Science course were written.

The student will be able:

1. To set up and solve proportions using direct, joint, inverse, and combined variation.

2. To name the number of significant digits in a numeral and to write sums, differences, products, or quotients of numbers to the correct number of significant digits.

3. To write scientific notation for numbers and add, subtract, multiply, and divide using scientific notation.

4. To convert from one unit to another in the same system of measurement using the multiplicative identity.

5. To solve linear and quadratic equations with rational coefficients with real number of literal solutions.

6. To construct a two-dimensional graph, given data or an equation.

7. To construct an equation, given a two-dimensional graph, or data.

8. To compute the areas of rectangles, triangles, and circles.

9. To compute the volumes of cylinders, spheres, and prisms.

10. To name the slope of a line, given a linear equation or the graph of a linear equation.

11. To draw vector quantities and add and subtract vector quantities.

Each objective has a planned program sheet which includes instructions for taking a pretest on the objective. Pretests may be taken in any order. After any pretest, another pretest may be taken or the student may begin selecting resources to use to attain the objective. The resources for eight of the eleven objectives include a modular instructional packet for which the student may use the computer. A student may use as many or as few of the resources as he feels necessary to reach the objective. Students progress at their own rate through any sections of the course they wish. Use of a post-test helps them to evaluate their attainment of the objective. Conversation with other students is deemed an acceptable way to learn; and, of course, the instructor is available for consultation and individual tutoring.

(Excerpt, Student Folder, June, 1969)

Math Skills for Science

PLANNED PROGRAM SHEET OBJECTIVE NO. 1

Purpose The student will be able to set up and solve proportions involving direct, joint, inverse, and combined variation.

Criterion Performance

Given 4 problems, will solve all correctly.

a. direct variation
b. joint variation
c. inverse variation
d. combined variation

Sample Test Items

a. If a circle has a radius of 6 inches and a circumference of approximately 37.7 inches, what is the circumference of a circle - with a radius of 7 inches?

b. If a person needed 6 hours to travel 293 miles, how many hours will be needed to travel 390 miles at the same rate (to nearest tenth of an hour)?

Resources Pretest)123456 A APL

Computer Instruction - Variation
on math/student number need flip book

Tape: Ratio and Proportion

Filmstrips: 633 Direct Variation

Textbooks: Modern Algebra Book I Dolciani pages 442-457
Algebra First Course Fehr pages 373-406

Programmed Text: Encyclopedia Britannica Math Learning Center
Ratio and Proportion

Post-test)123456 K APL

Elementary School Subjects

Concentration of the elementary design team during Phase I has been on the development of elementary school arithmetic materials. Under the leadership of the Teacher Specialist in Pupil and Program Appraisal, Beverly Sangston, the team emphasized the creation of new materials as a very limited number of programs had been written on the elementary level.

The modular instructional packages that are nearing the end of the developmental stage in elementary arithmetic are listed below:

1. A drill and practice series in the addition, subtraction, multiplication and division of whole numbers. This package includes survey tests and diagnostic tests for each operation and will be available for use at all elementary grade levels.

2. A program designed to teach a child to find the perimeter of a polygon by addition. This is intended for use at the third and fourth grade levels.

3. A tutorial dialogue designed to teach a child to construct the expanded form of a three-place numeral showing place value.

Several other topics have been selected for future development. These include:

1. The association of a number name with a specific set, using counting as an operation for finding the name of a set.

2. Reading and constructing line and bar graphs.

3. Comparison and simplification of fractions.

4. The use of scientific notation for writing large numbers.

The elementary design team during Phase II of the project will not limit modular instructional package development to arithmetic alone. Topics in language arts, social studies, and science will be identified in the near future.

Social Studies and French

Project objectives defined social studies and French as areas of secondary emphasis in curriculum development. During Phase II of the project, these areas will be explored in greater depth.

Under the leadership of the Teacher Specialist in Staff Development, Kenneth Walter, the social studies team are beginning their initial development, following their orientation and training program.

The French design team, under the leadership of the Teacher Specialist in Research, Irene Goding, has recently become operational. The team will review and evaluate existing CAI French programs for the junior and senior high school levels and adapt these programs where feasible. In addition the French design team will identify areas for modular instructional package development.

PROCEDURES FOR DEVELOPMENT

Once having decided upon the curriculum areas to be developed, the project staff set out to formulate a uniform set of procedures for the development of the modular instructional packages. These procedures have been followed by each design team. This sequence of development has not only provided educationally sound individualized programs but also has allowed optimum use of staff time. The Curriculum Development Sub-Plan established the procedures.

After the selection of a topic has been made, the MIP author will state the objectives for the program in behavioral terms. The author will arrange these behaviorally stated objectives into a hierarchy and identify those necessary to enter the program as "entering behaviors" and those necessary to achieve the terminal behavior as "enabling objectives."

Criterion items are then written for each objective and arranged into a pretest and post-test to be used with the package.

Decisions to be made at this point are ones of strategy and technique. The author must determine the strategy for his program taking into account his commitment to individualize each instructional segment and, within the framework, select the best CAI technique to accomplish his objective.

Once the foundation has been constructed, the author is ready to write the instruction that will enable the student to achieve the objectives of the program. The teacher's knowledge, experience, and creative talents are of major importance to this section of development. In conjunction with planning the instructional guides, the author prepares any materials to be used to complement the material presented on the terminal.

The package is then given to a computer programmer and coded for the system. After coding, the programmer debugs the MIP and prepares it for review by the course author. Necessary changes are made and the package becomes ready for review by a small group of students. Observations are made by the author during this trial run and desired changes subsequently incorporated.

After these procedures, the MIP is ready to be validated through use by a large number of students. The research design will be discussed in the next chapter of this report.

Documentation, which has been integrated into each step of the developmental process, is then completed. The package becomes available for use within the CAI instructional setting.

SUMMARY OF MODULAR INSTRUCTIONAL PACKAGE PRODUCTION

Because of limited availability of suitable CAI software, the staff had to develop materials for use in the project. Fourteen single concept modular instructional packages have been developed in the areas of senior high mathematics, elementary arithmetic, junior high science, and senior high chemistry and physics. These packages use a variety of presently known CAI techniques such as drill and practice, simulation, remote computing, testing, and tutorial dialogue. The project staff is attempting to extend these techniques and develop new ones. Development of these packages has been, for the most part, on a design team basis with full-time and part-time staff members working together.

Materials are developed according to the development procedures specified in the project's Curriculum Development Sub-Plan:

1. Terminal objectives for the module will be written.
2. Enabling objectives will be written.
3. These objectives will be arranged into a hierarchy.
4. Minimum entering measurable behaviors will be written with criterion tests for each.
5. Criterion tests for each objective will be written.
6. A pretest and post-test for the module will be prepared.
7. Instructional strategies will be developed, including the CAI techniques to be used, the stimuli for activating student responses, additional materials to be used, and kinds of data on performance to be accumulated.
8. The segment will be written.
9. Instructional materials of other types will be prepared.
10. The unit will be coded.
11. The unit will be debugged.
12. The unit will be tested with a small number of students. Student reactions will be collected.
13. The unit will be revised.
14. Evaluative techniques will be used to ascertain validity and reliability.
15. Documentation will be completed.

RESEARCH

Contributor

Irene D. Goding

OVERVIEW

Attitude questionnaires were developed, possible themes for research designs were identified, methods of evaluating the outcomes of CAI software were outlined, and several research designs were delineated. Activities initiated during this Phase are to be continuous throughout the life of the project. Progress toward the project goals was made through the coordinated efforts of the Department of Research of the Montgomery County Public Schools and the CAI project staff.

Identification of possible themes to be developed into research designs, procedures established in the Validation Sub-Plan, a parent attitude survey, an attitude measurement device for students, and several specific research designs are contained in this chapter.

PHASE I PLANS

Goals of research for Phase I as outlined in the Project proposal and the Continuation Grant were:

1. Gathering research data on teacher reaction and student attitudes toward Computer-Assisted Instruction
2. Initiating project activities to survey and try out available Computer-Assisted Instruction software and designing research activities to evaluate outcomes and study the learning process in the Computer-Assisted Instruction setting
3. Initiating activity to define issues inherent in classroom use of Computer-Assisted Instruction that will require research and development activities.

All of these objectives initiated in Phase I are to be continuous throughout the life of the project.

Research efforts to meet these goals were made by the Department of Research and the Computer-Assisted Instruction project staff. Plans were delineated for developing research designs for Phase II and III, attitude questionnaires were developed, and several research designs were outlined.

POSSIBLE RESEARCH THEMES

In an effort to meet the goal of initiation of activity to define issues inherent in classroom use of Computer-Assisted Instruction that will require research and development activities, the teacher specialists and the director developed a list of approximately 200 questions and problems as possible themes to be developed into research designs. This list contains varied topics such as: "Is the image projector more effective than other display techniques?"; "What is the fatigue level at the terminal?"; "Is simulation as effective as doing the experiment?"; "How many students should be tested on the material before it is given to a large group?"; "How much training is necessary to be an author?"; and "What is the effectiveness of various prompts?" A priority list was established by the teacher specialists. Each teacher specialist indicated the topics he felt were most important to the Computer-Assisted Instruction project. From this priority list, the initial project research is to be developed.

The Validation Sub-Plan was developed to outline the methods of evaluating the outcomes of the Computer-Assisted Instruction software by initiating project activities to survey and try out available Computer-Assisted Instruction software and by designing research activities to evaluate outcomes and study the learning process in the Computer-Assisted Instruction setting. Validation as defined in the sub-plan is a means of determining if students have met the behavioral objectives of a modular instructional package. The procedures established in the Validation Sub-Plan were arrived at by review of other validation strategies and discussion among staff members. The systems manager and the teacher-specialist in research worked together to determine what data would be needed for validation purposes and what the format for the print-outs of this data should be. The curriculum authors were also involved in these discussions. For example, the teacher specialists and the systems manager established a policy for labels and EP identifiers so that each test question would be directly tied to its objective. With this direct relationship between EP identifier and objective, the curriculum author will be able, on review of the validation charts, to determine what objectives have been met. Test construction techniques, methods for determining reliability, and staff responsibilities were also stabilized. After the first draft was written, the director, the teacher specialists, and the systems manager were given a copy to review; and the necessary revisions suggested by them were included in the final draft.

PARENT ATTITUDE QUESTIONNAIRE

A survey of parents opinions about Computer-Assisted Instruction was distributed at the end of Phase I to the parents of Einstein High, Newport Junior High, and Pleasant View Elementary Schools to determine the receptivity of the community to Computer-Assisted Instruction. This questionnaire was developed as a feature of the plan for studying the impact of Computer-Assisted Instruction upon the school and the community. Some time next year, after the program has become fully operative within the schools, the community will be surveyed to see what changes in perceptions of and attitudes toward Computer-Assisted Instruction have taken place.

This questionnaire was developed as a cooperative effort between the Department of Research and the project, with the Teacher Specialist in Research working closely with the Department of Research. In the initial stages of its development many ideas were suggested as possible areas of concern to be included. The survey was reviewed at the Department of Research several times, and the first questionnaire was lengthened for use in a pilot study with a group of parents.

This small pilot group of parents filled out the questionnaire and then answered questions regarding the survey which were asked them by an interviewer. In this way any problems involving the vocabulary used, the complexity of the questions, the respondent's feeling toward the question, readiness to answer the question, and the interpretation of the questions were identified. The parents also filled out the questionnaire a week later as a check for reliability. As a result of this pilot study many of the segments of the questionnaire were eliminated and much rewriting was done.

Since Computer-Assisted Instruction was a new concept to the majority of the parents polled, two new items had to be included. The first was a short description and picture of Computer-Assisted Instruction in the Montgomery County Public Schools setting; the second was the incorporation of a choice to be made by the respondent whether to fill out the complete questionnaire or a part of the questionnaire. It was hoped that the description would give the parents a base line for responding. Those people who did not want to fill out the questionnaire were able to indicate why and then turn to the end of the questionnaire to indicate what additional information they would like to have on Computer-Assisted Instruction. (See questionnaire on following pages.)

Montgomery County Public Schools
850 North Washington Street • Rockville, Maryland • 20850
Telephone (301) 762-5000

May 1, 1969

Dear Parent:

Montgomery County Public Schools has undertaken a project which will investigate the use of computers in education. This Project (Project Reflect) is being funded by the Department of Health, Education, and Welfare and deals with a new instructional aid - - Computer Assisted Instruction.

The computer is located in Einstein High School; and there will be student stations in Einstein High, Newport Junior High, and Pleasant View Elementary schools. Some students from grades kindergarten through twelve will be involved, using the computer to assist them in their learning about various subject areas. There are a few similar projects throughout the United States using the computer to assist with the instruction of children of different ages and in various subject areas.

You will find a questionnaire enclosed with this letter. The questionnaire contains both some information about Computer Assisted Instruction and some questions that we hope you will be willing to answer. We would appreciate your filling out the enclosed questionnaire so that we will know how you as a parent feel at this time about using the computer as an aid in the instruction of your child. Toward the end of the project we will again ask you to express your opinions on Computer Assisted Instruction. Parental opinions both at the beginning and end of the project will be analyzed to determine the receptivity of the community to Computer Assisted Instruction. When you have answered the questionnaire, please return it to school by the child who brought it home to you.

Thank you for your cooperation.

Yours truly,

J. J. Tarallo

Joseph J. Tarallo
Assistant Superintendent
for Administration

JJT:jwk

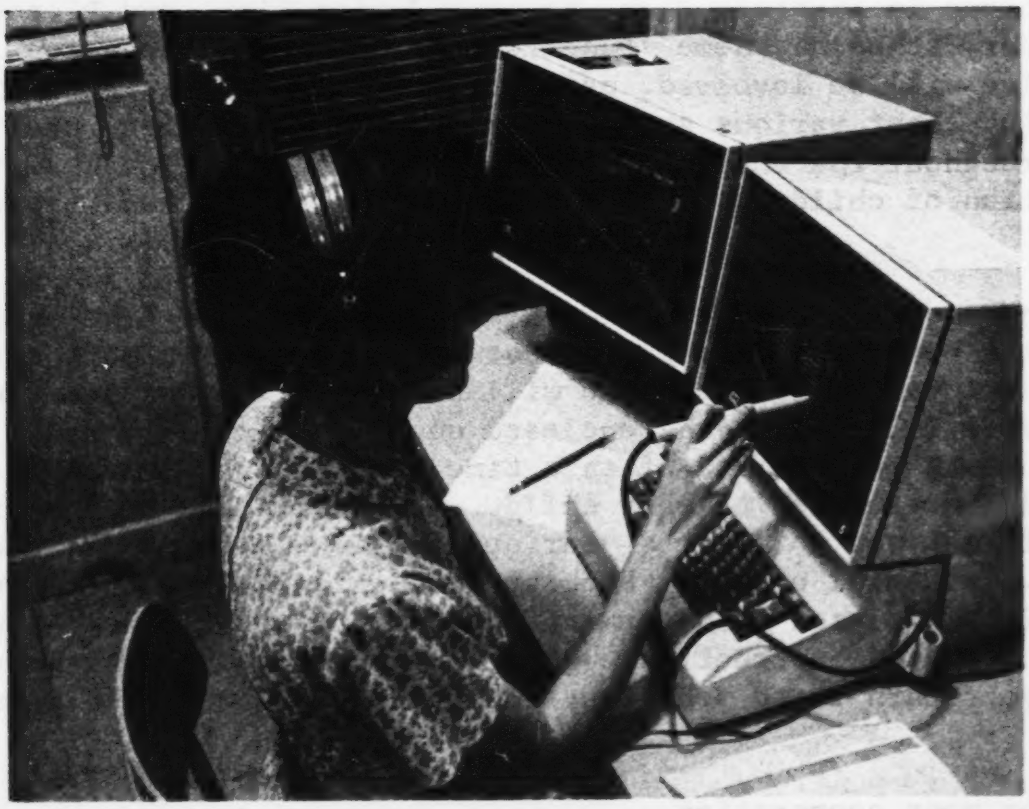
Enclosure

MONTGOMERY COUNTY PUBLIC SCHOOLS
Department of Research
Project Reflect

Survey of Parents' Opinions About Computer Assisted Instruction

Computers are being used widely in our society today. For example, many people receive bills and/or paychecks that have been processed by a computer. The space program also uses a computer in various aspects of its operation -- one example of this is the use of the computer with the most recent Apollo launches.

Computers are now being used in education and some of the students of Einstein High School, Newport Junior High School and Pleasant View Elementary School will be working at student stations which will be connected to a computer. The picture below shows some of the equipment the student will be working with at the "student station."



The instructional material on the television-type screen (Cathode Ray Tube) is mathematics. The other instructional display is on a slide projector-type screen (Image projector). The student is listening to an explanation through the earphones. These visuals and sound materials are being transmitted under the control of a computer. The student will be asked to perform a task, and she can answer either by responding on the keyboard or by pointing to a spot on the "television-type" screen with the light pen. The computer will "receive" her reply and let her know whether she is right or wrong and what she is to do next. Thus, computer-assisted instruction uses computers to transmit information to students, to give them learning tasks, to receive their answers, and to "decide" what to give the student as the next step in the learning process.

The instructional materials can be in almost any subject: writing, spelling, grammar, listening, art, etc. Each instructional program is developed by educators. A program is "stored" by the computer and is transmitted to the student, upon demand. Many students can receive programs from the same computer at the same time. Students may be at different points in the same program or may be working with different subjects at the same time.

We are interested in knowing how you feel about Computer Assisted Instruction. We realize that for many of you this short description above is the first information you have received about Computer Assisted Instruction. We would still like to have your reactions. Later, in about a year, it would be interesting to see if there have been any changes in your reactions after students have been involved with Computer Assisted Instruction.

Would you be willing to answer some questions about computers used in education? Before you answer this question, thumb through the questionnaire to get an idea of what sort of questions are asked.

( ) Yes ( ) No

If you answered yes continue on to the next page.

If you answered no please indicate why below and then turn to page 6 to indicate what information we can send you about Computer Assisted Instruction.

( ) I am not familiar enough with the subject matter.

( ) I do not have the time to answer the questionnaire.

( ) Other ____.

How much do you feel Computer Assisted Instruction will benefit the following:

	very beneficial	beneficial	no opinion	harmful	very harmful
1. Kindergarten children	( )	( )	( )	( )	( )
2. Elementary school pupils	( )	( )	( )	( )	( )
3. Junior high school students	( )	( )	( )	( )	( )
4. Senior high school students	( )	( )	( )	( )	( )
5. Average learners	( )	( )	( )	( )	( )
6. Slow learners	( )	( )	( )	( )	( )
7. Fast learners	( )	( )	( )	( )	( )
8. Boys	( )	( )	( )	( )	( )
9. Girls	( )	( )	( )	( )	( )
10. Other ______________	( )	( )	( )	( )	( )

How useful do you think Computer Assisted Instruction will be with the following subjects:

	very useful	useful	no opinion	almost useless	totally useless
1. Mathematics	( )	( )	( )	( )	( )
2. Science	( )	( )	( )	( )	( )
3. English	( )	( )	( )	( )	( )
4. Social Studies	( )	( )	( )	( )	( )
5. Foreign languages	( )	( )	( )	( )	( )
6. Art and music	( )	( )	( )	( )	( )
7. Vocational subjects	( )	( )	( )	( )	( )
8. Reading	( )	( )	( )	( )	( )
9. Spelling	( )	( )	( )	( )	( )
10. Arithmetic	( )	( )	( )	( )	( )
11. Physical education	( )	( )	( )	( )	( )
12. Other ___________	( )	( )	( )	( )	( )

Below is a list of statements some people have made about the possible effects of Computer Assisted Instruction. Do you think these outcomes are likely or unlikely to occur?

	very likely	likely	no opinion	unlikely	very unlikely
1. The student's interest in his subjects will increase.	( )	( )	( )	( )	( )
2. The student's creative abilities will be stimulated.	( )	( )	( )	( )	( )
3. The student's social development will be impeded.	( )	( )	( )	( )	( )
4. The student's reading skills will drop from disuse.	( )	( )	( )	( )	( )
5. The student will learn more.	( )	( )	( )	( )	( )
6. The student will benefit by knowing immediately whether his answer is right or wrong.	( )	( )	( )	( )	( )
7. The student's grades will get better.	( )	( )	( )	( )	( )
8. The student will be isolated from his class.	( )	( )	( )	( )	( )
9. The student will get more individual attention from his teacher.	( )	( )	( )	( )	( )
10. The student will learn at his own rate.	( )	( )	( )	( )	( )
11. The student will benefit from the teacher's having more time to plan his activities.	( )	( )	( )	( )	( )
12. The social aspects of the learning situation will be reduced.	( )	( )	( )	( )	( )
13. The student will develop more discipline in his thinking.	( )	( )	( )	( )	( )

Have your children ever had contact with the following instructional aids in their schools?

		Yes	No	Do Not Know
1.	Educational television (Channel 26)	( )	( )	( )
2.	Commercial television (i.e., Channels 4,5,7,9)	( )	( )	( )
3.	Tape recorder	( )	( )	( )
4.	Record player	( )	( )	( )
5.	Films	( )	( )	( )
6.	Filmstrips	( )	( )	( )
7.	Programmed textbooks	( )	( )	( )
8.	Teaching Machines	( )	( )	( )
9.	Dial Access	( )	( )	( )
10.	Computer (i.e., teletypewriters, Cathode Ray Tube)	( )	( )	( )

Have you had any evidence that these instructional aids have helped or hindered the education of your children?

		Helped	Hindered	No Evidence
1.	Educational television (Channel 26)	( )	( )	( )
2.	Commercial television (i.e., Channels 4,5,7,9)	( )	( )	( )
3.	Tape recorder	( )	( )	( )
4.	Record player	( )	( )	( )
5.	Films	( )	( )	( )
6.	Filmstrips	( )	( )	( )
7.	Programmed textbooks	( )	( )	( )
8.	Teaching machines	( )	( )	( )
9.	Dial access	( )	( )	( )
10.	Computer (i.e., teletypewriters, Cathode Ray Tube)	( )	( )	( )

Would you like more information on Computer Assisted Instruction? Yes ☐ No ☐
If you checked yes, please indicate the material you would like from the list below and your name and address:

☐ Bulletin on Facilities of the Computer Assisted Instruction Demonstration Project - information on the physical layout of Project Reflect

☐ Bulletin on the 1500 Instructional System - information on the computer that the Computer Assisted Instruction demonstration project (Project Reflect) is using

☐ Bulletin on project objectives and phases of Project Reflect - information on the objectives of Project Reflect and the three phases involved in meeting these objectives

☐ Opportunity to view the computer and the student terminals

☐ Slide presentation on Computer Assisted Instruction

☐ Other ______________________________

Name ______________________________

Address ______________________________

____

FOR PURPOSES OF ANALYZING THE DATA FROM THIS QUESTIONNAIRE WE WOULD LIKE YOU TO FILL OUT THE FOLLOWING INFORMATION ABOUT YOURSELF.

SEX: ☐ Male ☐ Female

AGE: ☐ 20 - 30 ☐ 31 - 40 ☐ 41 - 50 ☐ 51 - 60 ☐ over 60

YOUR OCCUPATION ______________________________

YOUR SPOUSE'S OCCUPATION ______________________________

YOUR EDUCATION

☐ High School Graduate

☐ Some College

☐ College Graduate

☐ Graduate Work

☐ Graduate Degree

☐ Other __________

YOUR SPOUSE'S EDUCATION

☐ High School Graduate

☐ Some College

☐ College Graduate

☐ Graduate Work

☐ Graduate Degree

☐ Other __________

PLEASE INDICATE THE NAMES OF YOUR CHILDREN, THE SCHOOLS THEY ATTEND, AND THE GRADES THEY ARE IN. YOUR CHILDREN WILL NOT BE AFFECTED IN ANY WAY BY YOUR GIVING THIS INFORMATION.

FULL NAMES	**SCHOOLS THEY ATTEND**	**GRADES**
____________________	_________________________	___________
____________________	_________________________	___________
____________________	_________________________	___________
____________________	_________________________	___________
____________________	_________________________	___________

Please give this questionnaire to your child (who brought it home from school to you) to be returned to school.

Comments:

OTHER QUESTIONNAIRES

Student and teacher surveys are in the process of being developed by the Department of Research and the Teacher Specialist in Research. These efforts are being made to gather research data on teacher reaction and student attitudes toward Computer-Assisted Instruction. These two questionnaires will survey their respective populations to elicit the perceptions of, and attitudes toward, Computer-Assisted Instruction of students and teachers of the three involved schools before Phase II tryout of lessons begins. As of the end of Phase I, these questionnaires had been used with pilot study groups. The student pilot study group was composed of a seventh grade class and a tenth grade class. Each student who filled out a questionnaire was asked to underline any words he or she did not understand, comment on all questions, and indicate his or her feelings on the length. The pilot group of teachers was asked to do the same. Revision of the questionnaire is now in process, and the date of distribution for both is set for September, 1969.

An assessment of student opinion has been developed for on-line use with a summer math/science course. This course will develop those math skills that are necessary for chemistry and physics, and the students will be able to decide which segments of the course they will work with during the summer. The attitude questionnaire elicits the students' feelings toward math, chemistry, physics, computers, and Computer-Assisted Instruction by allowing them to complete a sentence by choosing one choice on a five-choice scale with opposing words at either end. Students will respond before they begin any course work and again at the conclusion of their course efforts.

A paper-and-pencil form of this attitude measurement was administered to students in both a chemistry class and a physics class. Five days later the same questionnaire was administered to the same students as a reliability check. Students were asked to underline any words that they did not understand, add new words that they felt appropriate, and add any comments. As a result of this, two of the choices were changed: Math is: Abstract . . . Practical was changed to Logical . . . Illogical; and Computers are: Promising . . . Frightening was changed to Polite . . . Rude.

YOU WILL BE PRESENTED SOME INCOMPLETE SENTENCES AND YOU ARE TO COMPLETE THE SENTENCES BY CHECKING THE BOX THAT BEST INDICATES HOW YOU FEEL. YOU WILL COMPLETE THE SENTENCES BY CHOOSING ONE OUT OF FIVE BOXES. THESE FIVE BOXES ARE ON A SCALE WITH OPPOSING WORDS SPACED AT EITHER END. YOU PICK THE BOX THAT YOU FEEL BEST COMPLETES THE SENTENCE.

UNDERLINE ANY WORDS THAT YOU DO NOT UNDERSTAND.

Which of these courses are you taking this year? ( ) Chemistry ( ) Physics ( ) Both
If you answered Chemistry do not answer question 3 "Physics is . . ." If you checked Physics or Both answer all the questions.

1. Math is

Easy	( )	( )	( )	( )	( )	Difficult
Creative	( )	( )	( )	( )	( )	Confining
Abstract	( )	( )	( )	( )	( )	Practical
Exciting	( )	( )	( )	( )	( )	Boring
Important	( )	( )	( )	( )	( )	Unimportant

2. Chemistry is

Easy	( )	( )	( )	( )	( )	Troublesome
Ordered	( )	( )	( )	( )	( )	Chaotic
Basic	( )	( )	( )	( )	( )	Unnecessary
Attractive	( )	( )	( )	( )	( )	Repelling
Clear	( )	( )	( )	( )	( )	Fuzzy

3. Physics is

Exciting	( )	( )	( )	( )	( )	Boring
Useful	( )	( )	( )	( )	( )	Useless
Universal	( )	( )	( )	( )	( )	Limited
Lively	( )	( )	( )	( )	( )	Dormant
Simple	( )	( )	( )	( )	( )	Complex

4. Computers are

Helpful	( )	( )	( )	( )	( )	Frustrating
Accurate	( )	( )	( )	( )	( )	Inaccurate
Flexible	( )	( )	( )	( )	( )	Rigid
Personal	( )	( )	( )	( )	( )	Impersonal
Promising	( )	( )	( )	( )	( )	Frightening

5. Computer-Assisted Instruction is

Easy	( )	( )	( )	( )	( )	Troublesome
Friendly	( )	( )	( )	( )	( )	Unfriendly
Successful	( )	( )	( )	( )	( )	Unsuccessful
Exciting	( )	( )	( )	( )	( )	Boring
Beneficial	( )	( )	( )	( )	( )	Harmful

Comments:

SUMMARY OF RESEARCH

Phase I research activities were in planning and developing designs for implementation in Phases II and III. Research topics to be further developed were identified by the project staff. Attitude questionnaires were written; the parent attitude survey was distributed at the end of Phase I, while the teacher and student questionnaires were administered to pilot groups; an assessment of student attitudes was written for use on-line with a summer math/science course. Validation procedures for modular instructional packages were outlined in the Validation Sub-Plan. Some research designs were also identified for use during the summer and fall of 1969. Work will continue in all of these areas throughout Phases II and III.

PLANS FOR PHASES II AND III

Contributors

William M. Richardson
B. Jean Wastler

OVERVIEW

Project REFLECT is a three-year program with three phases, each of which parallels a year. This report indicates the progress made during Phase I (June 1, 1968, to June 26, 1969). Plans for the next two phases (Phases II and III) are summarized in this chapter.

CONTINUATION OF ACTIVITIES INITIATED IN PHASE I

Planning, in-service training, staff development and orientation, and materials preparation and review, described elsewhere in this publication, will continue throughout the project's duration. Periodic revision and resultant implementation of the Master Plan and the sub-plans will occur. Design team members, both full and part-time, will continue their development of modular instructional packets and their informal training. Facilities modified during Phase I will continue to be utilized.

PHASE II MODULAR INSTRUCTIONAL PACKAGE TRYOUT

Summer, 1969

Tie Your Math to Your Science Course, a series of modular instructional packets, is being used as a part of the Math Skills for Science special program offered at Albert Einstein High School for six weeks beginning June 26, 1969. The course, designed by Teacher Specialist in Curriculum Catherine Morgan, is described in the Mathematics section of the chapter on Modular Instructional Packet Development. This course is completely individualized with students selecting the objectives they wish to attain; objectives selected and resources used are based on individual need. The objectives of the course were selected through the use of a student questionnaire regarding skills necessary for success in chemistry and physics courses. Thirteen students, who have registered to take either chemistry or physics during the school year 1969-1970, are currently enrolled. Each student participating in the program will be matched with a counterpart who is not taking the summer course but who will be taking the same science course in the fall. Chemistry and/or physics tests will be administered to both groups at the end of the semesters to see if there has been a transfer of the math skills to the respective course work.

Students enrolled in the summer school remedial mathematics course at Pleasant View Elementary School are using the CAI drill and practice materials in basic arithmetic operations. These youngsters work at terminals located in the mathematics laboratory.

School Year 1969-1970

Modular instructional packages, described in a chapter of this report, will be employed in instructional programs in elementary arithmetic, secondary mathematics, junior high science, and senior high chemistry and physics. In addition, following the development of packets in those areas identified by design teams, lesson tryouts of new materials will occur. Social studies and French modular instructional packets will be developed, also, and be available for instructional use. Primary purpose of this Phase II implementation is validation of the individual modular instructional packets.

STAFF DEVELOPMENT

Summer Workshop

Twenty-four professionals, as a part of their twelve-month MCPS assignment, have been placed with the project one-half of each working day June 26 through

through August 7, 1969. Four of these teachers have completed the supporting teachers training course during the school year and will spend their assigned time developing materials. The other twenty persons are taking a revised version of the supporting teachers training program: an orientation to CAI and subsequent preparation for selecting and developing segments, in their subject area, which are compatible with CAI and the project goals. (See calendar on following page.)

Administrators Session

One hundred eighty administrators will visit the project for a two-hour presentation-demonstration on CAI as a part of a two-day workshop. Organized by the Department of Educational and Managerial Information and Analysis, the sessions are designed to give participants an understanding of computer technology and its present and projected uses in education. Principals, vice-principals, resource teachers, and other administrators will attend one of the six workshops to be held periodically between June 27 and August 14, 1969. Their visit to Project REFLECT will include a brief slide presentation on CAI and the MCPS CAI project, a group discussion following a demonstration in the terminal room, and a visit to the computer room.

CAI Participating Schools Committee

Philosophy of the project and plans for implementation during the school year 1969-1970 will be the emphasis points of a three-day in-depth continued orientation for the principals of the involved schools and the area director. A specific date for these sessions has not yet been set. In addition to CAI definition and those expected items, other enabling items to reach the terminal objective will be included. At the end of the sessions, the participant will be able to conduct a two-hour orientation to CAI and Project REFLECT for interested persons such as educators, members of the community, and others. A thorough knowledge is necessary for these administrators who serve as the curriculum leaders in their building and area.

Involved Teachers

Thirteen teachers, whose instruction will be assisted through use of the modular instructional packets available on the computer system, will participate in preschool sessions to aid in classroom implementation. Emphasis in these sessions will be on the philosophy of materials development: a MIP from selection to validation and documentation, operation and maintenance of student terminal devices, discussion of implementation of CAI in the classroom, and coordination between CAI staff members and teachers, so their training will be a firming up of the previous experiences. Six of those involved will participate in a five-day session, an abbreviated version of the supporting teachers course. Both groups will review the materials available for their students to use.

Twelve-Month Personnel of Involved Schools

One-day orientation sessions, scheduled on an individual basis with the person involved and the principal of the school, are planned for the summer of 1969. In this way, counselors, librarians, resource teachers, and other personnel will acquire knowledge of the project for use in working with students, parents, and teachers.

CAI DEMONSTRATION PROJECT - 1969 SUMMER WORKSHOP

Monday	Tuesday	Wednesday	Thursday	Friday
			26 Pretests Introduction to CAI and Project REFLECT	27 Overview of Workshop Educational Technology
30 Computer Fundamentals	July 1	2	3 MIP Development -Steps -Selecting an area	4 HOLIDAY
7 Study Guide Behavioral Objectives	8 Criterion Tests	9 Learning Hierarchies	10 Write Behavioral Objectives	11
14 Order Objectives into a Hierarchy	15	16 Write Criterion Test Items	17 CAI Techniques Flowcharting	18 Programmed Instruction
21 ← Computer Languages →	22	23	24 Preparation of I. M. Review and Revision Validation and Documentation	25 Review post-tests
28 ← Write Programs →	29	30	31	August 1
4 Review and Revise Programs	5	6	7 Submit Completed MIP Evaluation of Workshop	

Curriculum Supervisors

During the fall of 1969, a one-week orientation will be conducted for selected curriculum supervisors.

DEMONSTRATIONS AND PRESENTATIONS

Visiting times have been specified monthly for both student and adult visitors; individuals and small groups are encouraged to visit the project at the selected times. Two-hour orientations are conducted with the opportunity to hear a discussion of CAI, visit the terminal room and the computer room, and discuss the project.

Special demonstrations and presentations are arranged for larger groups, visitors from other installations, and those for whom time is avilable.

FACILITY EXPANSION

Four additional instructional displays with student terminals will be added to the computer system for use at Einstein High School during the summer of 1969. Following the installation of the cable between the computer room at Einstein and Pleasant View Elementary School, the four 1512 cathode ray tube devices will be moved to the elementary school for use during the school year 1969-1970. The typewriter terminal which was used in the mathematics laboratory at Einstein during the first phase of the project will be moved to the physics laboratory for use in remote computing.

Student performance data will be stored on magnetic tape. The unit is to be installed during the summer of 1969.

PHASE III

Continued modular instructional package development, research and evaluation, redesign of the staff orientation programs and evaluation of the impact of the revised program, development of a model plan for incorporating CAI into a large school system, and report writing and dissemination are planned for the third year of the project. Phase III begins in June, 1970, and ends May 1971, the date of the project termination.

SUMMARY OF PLANS FOR PHASES II AND III

Activities initiated during Phase I will continue throughout the life of the project. Preparation of modular instructional packages and adaptation of other curriculum materials will be followed by their tryout and validation. Staff development programs will continue at an expanding level. Research activities on the learning process will be initiated.

Phase III efforts will continue with initiated activities and will include, in addition, evaluation of CAI materials, documentation and reporting of findings, and the production of the model plan for the application of CAI in a large public school system.

APPENDICES

PERSONNEL

Director	William M. Richardson
Secretary to the Director	Marcia S. Decker
Teacher Specialists in Curriculum	John M. Boblick Catherine E. Morgan
Teacher Specialist in Instructional Materials	B. Jean Wastler
Teacher Specialist in Pupil and Program Appraisal	Beverly J. Sangston
Teacher Specialist in Research	Irene D. Goding
Teacher Specialist in Staff Development	Kenneth A. Walter
Technical Systems Manager	Ronald P. Welker, Sr.
Senior Programmer	James R. Eshleman
Instructional Coders	Mary C. Hoffman Anne M. Metzger Priscilla T. Smith
Computer Operator	Douglas W. Parker

SUPPORTING TEACHERS (10 per cent Staff Members)

Nita L. Axley	Highland Elementary	Elementary
James D. Cochran	Newport Junior High	Social Studies
Ann Cummins	Pleasant View Elementary	Elementary
Anne H. Dudley	White Oak Junior High	Foreign Language
Merrill E. Fisher	Bethesda-Chevy Chase High	Mathematics
John D. Gannon	Rockville High	Social Studies
Janet E. Hill	Takoma Park Junior High	Jr. High Science
Matthe J. Hormanski	Albert Einstein High	Sr. High Science
Keith C. Johnson	Newport Junior High	Jr. High Science
Richard King	Eastern Junior High	Jr. High Science
Eleanor T. Lautenschlager	Kensington Junior High	Mathematics
David A. McElroy	Albert Einstein High	Sr. High Science
James A. Miers	Walter Johnson High	Sr. High Science
Jean L. Murdock	Pleasant View Elementary	Elementary
Joan M. Piersol	Gaithersburg High	Mathematics
Thomas E. Robinson	Albert Einstein High	Mathematics
Mary L. Sawchenko	Albert Einstein High	Foreign Language
Jeffrey A. Schultz	Parkland Junior High	Social Studies
Grace Tigani	Springbrook High	Jr. High Science
Justin H. Wasilifsky	Bethesda-Chevy Chase High	Sr. High Science
Clara S. Wing	Charles W. Woodward High	Foreign Language
Sister M. Adele, S.N.D.	St. Martin's School Gaithersburg	Elementary